



Research paper

Triage, damned triage. . . and statistics: Sorting out redundancy and duplication within an Emergency Department Presenting Problem Code Set to enhance research capacity



Saartje Berendsen Russell (BN, Med)^{a,b,*}, Michael M. Dinh (MBBS)^{a,c},
Nerida Bell (BN, MN Clin Ed)^a

^a Emergency Department, Royal Prince Alfred Hospital, Missenden Road, Camperdown, Sydney 2050, New South Wales, Australia

^b Faculty of Nursing, The University of Sydney, Mallett Street, Camperdown, Sydney 2050, New South Wales, Australia

^c Discipline of Emergency Medicine, The University of Sydney, Fisher Road, Sydney 2006, New South Wales, Australia

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ABSTRACT

Background: Having a robust Emergency Department Presenting Problem Code Set (EDPPCS) is important for collecting and analysing data around Emergency Department (ED) activity, funding, bio-surveillance and research. This paper analyses the clinical utilisation of the current EDPPCS using two years worth of ED data collected as part of the larger state-wide Demand for Emergency Services Trends in Years 2010–2014 (DESTINY) project. This project proposes potential improvements in the current EDPPCS including a reduction in duplication and redundant clinical terms.

Methods: ED presenting problem fields were abstracted from the Emergency Department Data Collection (EDCC) Registry as entered by trained triage nurses. Frequencies of presenting problems were calculated and cross referenced with the EDPPCS. These were then categorised into clinically meaningful groups.

Results: There were 1,746,635 million eligible ED presentations during January 2013 and December 2014 to 23 level 5 or 6 EDs. Of these, there were 64,849 unique presenting problem entries with 450 terms being used more than 100 times during the study period. Of those 450 terms, only 177 (39.3%) matched the current EDPPCS.

Conclusion: Future iterations of the EDPPCS should be based on the evidence presented making it shorter, more comprehensive and systematic leading to improved triage performance, usefulness in research and bio-surveillance.

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Introduction

Triage is one of the most important functions in the Emergency Department (ED) [1–4]. It is a dynamic process that involves high level clinical assessment skills to assess both the degree of urgency of the patients presenting problem, and the most appropriate place in the ED for their treatment to commence [1–4]. Whilst the primary purpose of the triage process is unchanged, triage has evolved over time to influence patient flow by using triage information to cohort patients to different clinical streams or clinical areas for assessment and treatment [5,6]. Streaming can enhance ED performance by improving patient flow and resource allocation which

is important for ED demand and problems associated with ED overcrowding [7,8].

In New South Wales (NSW), publicly funded EDs generally use validated five-point triage scales such as the Australasian Triage Scale [9]. This classifies ED presentations from category one, referring to immediately life threatening conditions requiring immediate attention through to category five referring to less urgent or clinico-administrative problems in which assessment and treatment should commence in 120 min [3,4].

Triage nurses are trained to elicit the patients presenting complaint or reason for attending the ED [9,10]. This information is combined with patient assessment, obtaining relevant medical history and identifying any risk factors to inform the nurses' decision in determining an appropriate triage category for the patient [11]. Most Australian hospitals use an electronic record system to record the presenting problem and triage description data fields [3,4,12].

Historically, the triage presenting problem had free text capability as well as a list of pre-specified problems to select from. In

* Corresponding author at: Emergency Department, Royal Prince Alfred Hospital, Missenden Road, Camperdown, 2050, New South Wales, Australia.

E-mail address: Saartje.berendsenrussell@sswahs.nsw.gov.au (S. Berendsen Russell).

2012, the NSW Ministry of Health (MoH) implemented a new ED Presenting Problem Code Set (EDPPCS) with the view to limit free text ability so that the standardisation of data could be improved. The EDPPCS were based on the Emergency Department Reference Set (EDRS) developed in 2011 that described 389 presenting problems [12,13]. A robust presenting problem code set is important when it comes to collecting and analysing data around ED activity, research, activity based funding and bio-surveillance. Australian ED's have moved towards activity based funding models which rely on capturing relevant clinical data to resource EDs [14]. Poor quality data entries can not only hamper activity coding but impact on the ability to monitor or predict ED activity. While ED diagnosis is typically the most important data element used to determine funding the final diagnosis does not always account for the complexity of the clinical workup [15]. Using presenting problem data is also useful for public health syndromic surveillance and has significant clinical impact when placing patients into areas of the ED in consideration of potential infection control issues [16].

This paper analyses the clinical utilisation of the 2012 ED Presenting Problem Code Set using ED data collected over two years as part of the larger state-wide Demand for Emergency Services Trends in Years 2010–2014 (DESTINY) project [17]. The objectives of this project were to identify potential improvements in the current EDPPCS including a reduction in duplication and redundant clinical terms and standardisation in the list order of presenting problems. In doing so we sought to ensure the information obtained at triage is reliable and valid, enabling future projects aimed at developing clinical risk scores [18] and bio-surveillance achievable at the point of triage.

Methods

Setting and design

DESTINY was a retrospective analysis of a population based registry of ED presentations to public hospitals in NSW. NSW has the highest population in Australia with a population of around 7.5 million people and a land area of 850,000 km².

Database

The Emergency Department Data Collection (EDDC) Registry routinely collects patient level data on 150 of the 186 designated Emergency Departments in NSW. The EDDC is managed by the Health System Information and Performance Reporting Branch of the NSW MoH [19]. The NSW MoH defines 'level' delineations for public hospital Emergency Departments taking into account the complexity of clinical activity and the staffing and support services at each given hospital [20]. Level six ED's are tertiary referral major trauma centres while Level one ED's are small rural multi-purpose centres [20].

Data variables

ED presenting problem fields were extracted from the EDDC Registry, entered by triage nurses. Triage nurses are specifically trained and experienced Registered Nurses who have completed a triage training course that is based on the Triage Education Kit promulgated by the MoH [9].

Presenting problems were mapped to equivalent Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT).

Patients

Patients were included in this analysis if they presented to a level five or six Emergency Department between January 2013 and December 2014.

Outcome

The outcomes studied were the number and type of presenting problems documented during the study period.

Statistical analysis

Presenting problems were identified from the dataset and frequencies of each presenting problem calculated. Presenting problem entries were cross referenced with the 2012 NSW EDP-PCS. These were then categorised into clinically meaningful groups by the study investigators including cardiovascular (chest pain, arrhythmias), respiratory (shortness of breath, cough), gastrointestinal (abdominal pain, vomiting), and injury (fractures, trauma). The full classification list has been described elsewhere [19]. To obtain a final list of presenting problems, we grouped all presenting problems with identical meaning together within the categories described above. We defined duplicate terms as ones that had similar or identical clinical meaning, for example 'AP,' 'ap,' 'A Pain,' 'a/pain,' 'abdo pain,' 'adbo apin,' 'LUQ pain,' 'RLQ pain,' 'pain LLQ,' 'Pain RLQ,' 'umbilical pain,' 'epigastric pain,' 'R side abdo pain,' 'L abdo pain,' 'R/AP,' 'L/AP.'

Redundant presenting problems were defined as those with little or no clinical meaning such as 'patient care review' and 'pain, other' and grouped together.

Ethics

The study was approved by the NSW Population Health Services Research Ethics Review Committee.

Results

There were 1,746,635 eligible ED presentations during January 2013 and December 2014 to 23 level five or six EDs. Presenting problems were recorded in 99.79% of cases. Of the 1,746,635 entries, there were 64,849 unique presenting problem entries with only 450 terms being used more than 100 times during the study period.

63,433 (97.8%) entries were used 10 times or less indicating that these were free text entries. Of the 450 terms entered greater than 100 times, only 177 (39.3%) matched the 2012 Ministry of Health EDPPCS.

The most frequent presenting problem was 'Pain, abdominal,' entered 146,208 times (8.4%). In the top 450 presenting problem types that were entered more than 100 times during the study period, duplications of the terms for abdominal, epigastric, and flank types of pain actually accounted for 187,758 (10.75%) entries. There were similar discrepancies for other presenting problem types whereby the duplication altered the actual frequency of the presentation type. For example 'pain, chest' appeared to have 124,415 (7.12%) entries and 'respiratory – shortness of breath' 67,009 (3.84%) entries but when duplications were accounted for, there were 135,345 (7.75%) and 74,368 (4.26%) presentations respectively.

Confusion had 381 duplicates that were entered 4626 (0.26%) times and redundant problems like 'Care – patient review' and its duplicates were entered 52,663 (3.02%) times. The presenting problem 'Unwell' was entered 64,298 (3.68%) times while 'Other' had 17,396 (0.10%) presentations in this data set.

Table 1
Revised ED Presenting Problem Code Set based on 2013–2014 DESTINY Data.

Category	Sub category examples *Not in current EDPPCS ^duplicate versions in EDPPCS	Number of in duplicates in subcategory	ID (Snomed concept)	Frequency N = 1663605	
Gastrointestinal	Abdominal pain^	12	41931001	161045	
	*Epigastric pain	3		5503	
	*Flank pain	6		21210	
	*Haematemesis	2		869	
	*PRB/maleana	7	2901004	11570	
	Nausea and or vomiting^	4	422587007 422400008	35113	
	*Constipation	2		2171	
	Diarrhoea^	2	62315008	24340	
	Foreign body gastrointestinal tract^	1	33334006 211644003	2299	
	Cardiovascular	Collapse, (pre)syncope^	8	271787007	27180
Dizziness^		4	404640003	28041	
*Arrhythmias, Palpitations^		6	80313002	19611	
Chest pain^		9	29857009	135345	
Hypotension^ Hypertension*		5	45007003	3016	
Cardiac arrest^		2	410429000	1504	
Haemorrhage^		2		2191	
*Pleuritic pain		1		102	
Choking/Foreign body respiratory tract^		2	249489001 262599003	610	
Shortness of breath^		9	267036007	74368	
Respiratory	Asthma^ wheeze^	3	195967001 56018004	4864	
	*Cough, *haemoptysis	4		18216	
	Infection^	5	178280004 443137009	12594	
	Fever^	3	386661006	24793	
	Fever, cough^	1	135883003	2031	
	*Fever, rash	1		128	
	*Fever, immunosuppressed	1		802	
	*Cold and flu symptoms	2		2544	
	Injury, region (limb, hip etc)^	20	128069005 81102000	114621	
	Infection	Injury, type (fracture, laceration)^	16	399963005 262595009	64263
*Injury, other		1		2109	
Falls^		4	161898004	46010	
MVA^		6	127348004	15228	
Trauma^		2	262519004	15517	
Burns^		9	426284001 23346002	7033	
*Alleged assault, *sexual assault		6		4187	
Pain, region^		40	21522001 161891005	154537	
Musculoskeletal		Pain, type^	7	824230001 82991003 213257006	23183
		Unwell^	7		72599
	*Other	1		17396	
	Neurology	Headache^	3	25064002	35679
		*Confusion	2		4072
		Seizure^	4	91175000	12933
		Weakness^	5	309774006 95666008	9090
		Altered level of consciousness^	7	271782001 419045004	10848
		*CVA	2		808
		Altered sensation^	3	247325003	5715
Altered gait^		5	22325002 302289002	1078	
Mental health		Altered speech^	1	29164008	2100
		Altered vision^	3	7973008	4560
	Self harm^	3	248061004	8087	
	Depression^	3	35489007	4998	
	Suicidal ideation^	3	6471006	14271	
	Anxiety^	2	48694002	6519	
	Mental health problem^	14	413307004	42134	
	Toxicology	*Overdose^	4	75478009	9623
		Alcohol related^	4	25702006	6381
		*Drug related	1		186
*Requesting detox		1		204	

Table 1 (Continued)

Category	Sub category examples *Not in current EDPPCS ^duplicate versions in EDPPPCS	Number of in duplicates in subcategory	ID (Snomed concept)	Frequency N = 1663605
ENT, face	Ear problem^	10	162345004 15188001	11472
	Nose problem^	5	64531003 232209000	5714
	Throat problem^	3	162397003	10336
	Mouth problem^	2	102616008	6318
	Dental problems^	7	27355003	8293
	Eye problems^	14	75705005 267041004	28675
	Administration	Blood test/results^	7	3965550006
Wound issue^		7	410330006	9798
Requests post exposure prophylaxis^		5	283596007	2246
Requests medication, script or certificate^		6	184770004	7898
Review^		5	171430003	52663
Requests investigation^		4	394838008	9949
Catheter related problems^		1	392020005	1896
Cast related problems^		2	180300007	2073
Device and tube care^		4	385809004	1660
Concern, ADLs^		10	160877008	4051
Urology	Urinary problem^	12	34436003	27448
	Testicular problem^	2	63901009	3783
Endocrine	Blood sugar issue^	3	80394007 302866003	5887
Obstetrics and Gynaecology	Per vaginal bleeding^	5	289530006	25516
	Gynae issue^	4	38343000	640
	Pregnancy related issues^	4	289209003	7324
Skin	Cellulitis^	2	128045006	15289
	Rash^	2	271807003	12214
	Allergy^	2	106190000	10491
	Bite/sting^	6	276433004	9384
	Mass/abscess^	8	128477000	14793
	*Skin disorders	1		547
	Swelling^	3	65124004	13656
	Foreign body skin^	4	93458008	5998
Haematology/Oncology DNW	*Complications/chemo	1		1346
	Did not wait^	3		767

Using the presenting problem list from the top 450 presenting problems that were entered more than 100 times, we generated a revised EDPPPCS by grouping duplicate presenting problem types and classifying free text. We also sought to order the presentations consistently by body system then symptom which is not done in the EDPPCS. This list has 90 presenting problem types (see Table 1).

Discussion

The present study was performed to try and identify areas of improvement in presenting problem data fields at triage in EDs across NSW. We used the state-wide Emergency dataset from tertiary level EDs between January 2013 and December 2014 and identified all the presenting problems entered by triage nurses. The analysis identified significant issues with respect to the triage presenting problem data field including extensive use of free text, duplication of presenting problem types, missing common presenting problems, list order of presenting problems and use of redundant presenting problem type. This limits the usefulness of the presenting problem field for research, surveillance and monitoring ED activity.

The use of free text in the presenting problem data field is problematic because of the additional work required to reconcile idiosyncrasies in data entry such as abbreviations, inaccurate spelling, punctuation and grammatical errors and terminologies unique to individual EDs. In order to establish accurate presentation data, all presenting problems outside of the terminology used in the ED Presenting Problem Code Set needed to be manually searched and regrouped appropriately. Abdominal pain was

the most common presenting problem to ED and yet patients presenting with 'abdominal pain' were found to have over 19 different permutations documented in the EDPPCS. This was confounded further by abdominal pain presenting problem types prefaced by additional text such as 'sent in by' 'SIB' 'SIBGP' 'represents with' 'patient walked into department with.' Dealing with these issues added around 2 months of additional analysis time on the DESTINY project [17].

Several common ED presenting problems remain excluded without clinically sound alternatives. For example 'confusion' was a relevant and frequently entered presenting problem but not available in the 2012 EDPPCS. The closest alternatives were 'MH – altered mental status' where MH indicates mental health, or LOC – drowsy, or LOC – unconscious, none of which accurately described the clinical problem of being 'confused.' In addition, 'MH – altered mental status' was found in a grouping of MH issues including self harm, hallucinations, suicidal ideation etc. Choosing the 'MH – altered mental status,' option was not clinically appropriate if the assessment and diagnosis was organic in nature such as in stroke, delirium, sepsis, or dehydration.

'PR bleed' was another presenting problem which is not on the NSW list with the closest alternative being 'Bleed malaena' which does not cover overt rectal bleeding.

Additionally, terms like 'Injury' and 'pain' were all grouped together with either a limited body region (i.e. upper limb, mouth, head, chest) or specific mechanism (i.e. fracture, laceration, abrasion) to choose from. This can create clinical confusion when the injury that presents cannot be entered as it is not on the list. The authors contend that broad terms need refining to ensure a concise

presenting problem list. However, suggest that the decisions as to whether to use either a body region (and which region) or mechanism of injury or a combination should be a consultative process taking into account what is clinically useful, what assists in injury surveillance, and takes into account what is actually presenting to ED. Similarly including symptoms like diarrhoea, fever with cough or rash, or fever with recent travel, could be beneficial for both clinical and bio-surveillance reasons. Overall, ongoing clinician and informatics consultation is required to determine how specific presenting problems should be documented and what data is considered clinically meaningful without adding to the time constraints of the triage process.

Finally the entire EDPPCS needs to be systematic and organised so the appropriate presenting problem can be quickly found and entered, either alphabetical or grouped into systems with appropriately grouped drop down boxes [21,22]. Currently there are a large number of available presenting problems with a mix of alphabetical and systems groupings, making selection of a presenting problem counter intuitive and time consuming. Triage is supposed to be a brief (3–5 min) process, from the time the triage nurse begins their assessment to the time of completion [3,4,9,11]. Time wasted and frustration searching for an appropriate presenting problem can delay treatment and impact performance measures. It can also bias clinicians into choosing inappropriate presenting problems or clinically meaningless presenting problems such as 'Care – patient review,' 'unwell,' or 'other' which are redundant entries that are very commonly used but that do not assist with streaming, bio-surveillance or research into ED activity. Clinicians may not recognise the severity of a presentation based on the presenting problem entered. An unwell patient referred for specialist review by another physician, a patient returning for non-urgent review, a patient seeking a second opinion for a low acuity problem can all have the same presenting problem and may not be differentiated by their triage category. This information can inhibit appropriate streaming and delay treatment which can have serious patient safety implications all because of the data entered and the way it is interpreted.

Conclusion

We suggest that the future iterations of the EDPPCS be based on the evidence presented in the present study making it shorter, more comprehensive and systematic leading to improved triage performance and usefulness in emergency research and trauma and public health bio-surveillance. Having a user friendly system will not only enhance triage performance at the clinical level but will help researchers and health care managers in being able to analyse unbiased ED trends and patterns of presentation.

Authors' contributions

SBR contributed to study design, literature search, data analysis and interpretation and manuscript preparation.

MD contributed to study design, data analysis and interpretation and manuscript preparation.

NB contributed to study design, and manuscript preparation.

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Conflicts of interest

None of the authors had a conflict of interest.

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