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Development and evaluation of a code frame to identify potential primary care presentations in the hospital emergency department

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Abstract

Objective: A major challenge in evaluating the appropriateness of ED presentations is the lack of a universal and workable definition of patients who could have received primary care instead. Our objective was to develop a standardised code frame to identify potential primary care patients in the ED.

Methods: A standardised code frame to identify which patients could potentially be treated in a primary care setting was developed and tested on all patient episodes of care who presented to the ED of the St George Hospital, Sydney, between December 2016 and February 2017. Sensitivity and specificity of the code frame were performed. The code frame was then tested on all presentations from 2011 to 2016 in the St George Hospital and The Sutherland Hospital in Sydney.

Results: Of 19 916 ED presentations, 5810 (29%) were potential primary care presentations. The code frame had a sensitivity of 99.9% and a specificity of 49.0%. Results were consistent (28%) when applied to 5 years of presentations (601 168 presentations).

Conclusion: This standardised code frame enables accurate retrospective local and national data estimations. The code frame could be used prospectively to evaluate interventions such as diverting patients to primary care settings, and to identify populations for specifically targeted interventions. The conservative nature of the code frame ensures that only those that can safely receive care in a primary care setting are identified as potential primary care.

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ORIGINAL RESEARCH

Development and evaluation of a code frame to identify potential primary care presentations in the hospital emergency department

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Key words: *ED, general practice, hospital emergency service, primary care.*

Key findings

- A major challenge in evaluating the burden of patients who present to the ED who could have been equally treated in primary care, is the lack of a universal and workable definition to identify these patients.
- We developed a workable standardised code frame that can be used retrospectively or prospectively, to identify which patients could have been seen in primary care. This robust tool will enable more accurate data estimations of primary care appropriate presentations in the ED, which have not been previously possible. This will help planning and policy efforts.

Introduction

Presentations to the hospital ED are consistently increasing worldwide and significantly outweigh population growth in Australia.[1,2] The diversion of specialist resources to presentations that could be better treated in primary care adversely affects the efficient performance of EDs, resulting in increased patient waiting times and increased length of stay.[3] Conversely, improved access to primary care results in better use of health dollars, continuity of patient care, reduced waiting times and reduced pressure on hospital acute services.[4,5]

There is no standardised definition of what constitutes a primary care appropriate presentation either in Australia or abroad. A systematic review of the literature[6] found a significant variation in the calculation methods used to report non-urgent visits to the ED with rates ranging from 4.8% to 90%, indicating that there is no standard method for identifying or reporting primary care appropriate patients in the ED.

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Patients who present to the ED in Australia are classified according to the urgency in which they must be seen using the Australasian Triage Scale (ATS):[7]

- ATS 1 Resuscitation – seen immediately
- ATS 2 Emergency – within 10 min
- ATS 3 Urgent – within 30 min
- ATS 4 Semi-urgent – within 60 min
- ATS 5 Non-urgent – within 120 min.

This method has commonly been used to calculate non-urgent presentations considered to be appropriate for primary care. The Australian Institute of Health and Welfare (AIHW) reported a primary care appropriate presentation to be any patient allocated as an ATS 4 or ATS 5 category, who did not arrive by ambulance, police or correctional services, was not admitted to hospital and was not referred to another hospital.[8] However, the ATS scale is an urgency scale, not a scale of the complexity of the case, which must also be taken into consideration, and the AIHW method was shown to overestimate primary care appropriate presentations.[9] The AIHW ceased reporting this statistic in 2013 and stated that they would resume reporting primary care appropriate presentations if the estimation method was improved in the future.[10]

The lack of reliable and reproducible criteria and methods for classifying primary care presentations in the ED results in unreliable estimations of the true burden of these presentations,[6,9,11] and the need for a robust workable method has been highlighted.[9] A standard definition of a primary care presentation is required to achieve consistency in the interpretation of data and to provide a tool for identifying patients for targeted interventions in the future. The aim of the present paper is therefore to develop a code frame to identify potential primary care presentations in the hospital ED for these purposes.

Methods

Study design

Retrospective audit of hospital ED medical records at the St George Hospital, a major trauma hospital in Sydney, Australia.

Ethics approval

The study was approved by the South Eastern Sydney Local Health District Ethics Committee, HREC 17/053 (LNR/17/POWH/146). Site-specific approval was also obtained from the participating hospitals.

Data collection

ED presentations were reviewed for the period December 2016 to February 2017 (19 916 records). De-identified medical record data were provided in electronic form by the Electronic Medical Records Data Manager.

Code frame development

An Advisory Committee was formed consisting of expert clinicians and researchers. The Committee comprised a Professor of Health Services Research, a Professor of General Practice, a General Practitioner, an Associate Professor of Emergency Services Research, a Registered Nurse and a Research Fellow. The Advisory Committee reviewed the existing code frame for a primary care presentation developed by Bezzina *et al.*,[12] who defined primary care presentations as:

- ATS 4 or ATS 5 category
- Self-referred
- Presenting for a new episode of care
- Unlikely to be admitted or ultimately not admitted.

Next, the committee reviewed the code frame by Siminski *et al.*[11] who added to this definition by including:

- Did not arrive by ambulance
- Presenting problem.

However, Siminski *et al.* did not specify what the presenting problem(s) was/were, which did not lend the code frame to broader universal application.

The Advisory Committee reviewed all ED presentations during February 2017 (6313 presentations) and adapted the code frame by adding and removing criteria as shown in Table 1.

The code frame was then tested on all ED presentations from December 2016 to February 2017 (19 916 episodes of care). The criteria were applied as an algorithm in the order listed in Table 1, for example, first all ATS category 1–3 presentations were excluded as being considered a potential primary care patient, then all patients who arrived by ambulance were excluded, and so on. Sensitivity (the ability to detect true positives) and specificity (the ability to detect true negatives) testing were performed.[13] The hospital admission code (that is, the code stating whether the patient was ultimately discharged from the ED or admitted into hospital) was considered to be the 'gold standard' to assess whether a patient was potentially suitable to be seen in primary care. Therefore, any patient who was admitted to hospital was considered an ED appropriate presentation (true positive) and those who departed from the ED were considered a potential primary care presentation (true negative).

Results

Table 2 shows that 29% (5810 of 19 916 episodes of care) were found to be potential primary care presentations.

The code frame had very high sensitivity (99.9%) in that it identified patients who were ultimately admitted to hospital and therefore not a primary care appropriate presentation, and the specificity was 49% it correctly identified those patients who departed and were therefore potential primary care patients (Table 3), when tested against the hospital admission code.

The code frame was then tested on larger data sets to establish if results would be consistent. The code frame was applied to all ED presentations from 2011 to 2016 at the St George Hospital (356 027 patient episodes of care) and to The Sutherland Hospital, Sydney (245 141 patient episodes of care); 28.7% and 28.4% of presentations respectively were considered to be potential primary care presentations. These results were approximately 40% lower than calculations based only on ATS 4 and ATS 5 codes.

TABLE 1. *Criteria for defining a potential primary care presentation in the ED*

Criteria	Action
Low urgency and/or acuity, indicated by being classified as triage categories four or five on the Australasian Triage Scale	Retained
Did not arrive by ambulance	Retained
Did not arrive by helicopter, police, community transport or internal transfer	Added
Were self-referred	Retained
Were not referred by aged care, community health, Department of Correctional Services, general practitioner, health direct, mental health, other, other hospital, outpatient	Added
Presenting for a new episode of care, this information code is not available and is determined by the presenting problem	Removed
Were not expected to be admitted, determined by 'First Decision to Admit†' code	Retained
Did not have a Triage Speciality Mode of Care code‡	Added
Presenting problem§ – not any of the following: • Abnormal results • Assault • Behavioural disturbances • Bleeding in pregnancy • Chest pain • Collapse • Confusion • Did not wait • Depression • Device care • Dislocation • Fever in immunosuppressed patients • Flank pain • Intoxicated persons • Mental health • Other (as there is insufficient information to draw a conclusion) • Overdose • Palpitations/abnormal heart beat • Per vaginal (PV) bleed • Self-harm • Suicidal ideation	Added

†'First Decision to Admit' code is a code applied as soon as the treating clinician has made a decision to admit the patient. This usually occurs after the clinician's clinical assessment but in some circumstances can occur earlier. This action alerts bed management to commence the process of bed allocation. ‡Triage Speciality Mode of Care refers to the triage nurse recognising that the patient's presenting problem fulfils a pre-existing hospital management pathway protocol and activating that pathway. Examples include activating a trauma call if the patient meets trauma team activation criteria, or activating a stroke call if a patient falls within the eligibility criteria for stroke thrombolysis. §Presenting problems are pre-specified categories in the electronic medical record system that the triage nurse selects to best describe the presenting problem.

Discussion

Using our code frame, 29% of patients attending the ED were deemed suitable for primary care. This method builds on the code frames developed by Bezzina *et al.*[12] and Siminski *et al.*[11] by including the presenting problem, and expanding arrival mode and referral source, to provide a standardised definition of a potential primary care presentation. The code frame can be used to identify potential primary care patients in the ED retrospectively.

This method concurs with the findings that the calculations based on ATS codes overestimate the degree of presentations.[9] This is because the ATS is an urgency scale and does not take into consideration the complexity of the patient's case. Nagree *et al.*[9] demonstrate this nicely by highlighting how an elderly patient with a fractured forearm cannot be safely discharged home without allied health support, but would not be considered high urgency on the ATS.

Our code frame is a robust method that can be used for triaging potential primary care patients because it uses presenting problem. Although effective, methods relying solely on diagnosis are only useful for retrospective analysis. The code frame used the 'First Decision to Admit' code, which is an alert activated within the electronic medical record as soon as the treating clinician had decided the patient needed to be admitted. This information is not available to the triage nurse at the time of arrival; however, it has been well documented that suitably qualified and experienced triage nurses can accurately predict those patients who will need admission at the time of presentation.[14–17] For the purposes of the present study, we could only use data codes that were

TABLE 2. *Primary care presentations in the St George Hospital ED, December 2016 to February 2017*

	No.	Balance
Total presentations		19 916
Exclude triage categories 1–3	10 903	
	10 903	
Triage categories 4 and 5		9013
Exclude arrival mode		
State ambulance	1233	
Community transport	4	
Helicopter	3	
Wheelchair	6	
Internal ambulance transfer	9	
Police/correctional services	22	
	1277	
		7736
Exclude source of referral		
Aged care	4	
Community health service	2	
Department of Community Services (DOCS)	2	
GP	401	
Health direct	2	
Mental health	3	
Other	2	
Other hospital	6	
Outpatients	4	
Source of referral	27	
	453	
		7283
Exclude First Decision to Admit		
Admit	852	
Transfer	4	
	856	
		6427
Exclude Triage Speciality Mode of Care		
Trauma call	2	
	2	
		6425
Exclude presenting problem		
Abnormal results	18	
Altered level of consciousness	1	
Assaults	9	

routinely collected and available retrospectively from the database. Substituting the 'First Decision to Admit' code with the triage nurses decision to admit potentially provides a systematic method to identify primary care patients prospectively. This may allow for future interventions to redirect patients who could safely be seen in primary care away from the ED. Redirecting non-urgent presentations to primary care has been shown to be effective in reducing non-urgent presentations in the ED and acceptable to patients.[18]

The code frame is highly sensitive in that it correctly identified a primary care appropriate presentation 99.9% of the time. Although the specificity was lower at 49%, it was deemed to be acceptable, especially if the code frame was being used prospectively, for it is prudent to err on the side of caution and see additional primary care presentations in the ED, as opposed to redirecting a patient with an urgent or complex condition to a primary care setting. The conservative nature of the code frame extends to the fact that it takes into consideration some patient behavioural characteristics to exclude patients from being considered suitable for treatment in a primary care setting. For example, a person with overt behavioural disturbances or an intoxicated person may well be clinically seen in a primary care setting, but patients and primary care providers may not be comfortable with these people in their waiting rooms and often primary care providers do not have the resources to deal with disruptive patients.

Several factors influence a patient's decision to attend the ED, including their perception of primary care, being able to get timely appointments,[19–21] convenience of having diagnostic facilities and specialists at hand,[19,20] age of the patient and number of comorbidities.[21] Consumer expectations have changed over time with people seeking flexibility around work and family commitments, while general practitioners are demonstrating a preference to work within normal business hours because the financial

TABLE 2. *Continued*

	No.	Balance
Behavioural disturbances	3	
Bleed, PV	89	
Blanks (did not wait)	20	
Collapse	2	
Device care	43	
Depressed	3	
Injury, dislocation	9	
Intoxicated	1	
Mental health problem	22	
Other†	197	
Overdose	3	
Pain, chest	40	
Pain, flank	36	
Palpitations/abnormal heart beat	8	
Pregnancy related	104	
Self-harm	4	
Suicidal ideation	3	
	615	
Total potential primary care presentations		5810
Category 4 and 5 presentations (%)		65

Subtotal values are in italics. †Other has been classified as not being primary care appropriate because insufficient data is available to deem it a primary care presentation.

TABLE 3. *Potential primary care presentation code frame sensitivity and specificity testing*

	Hospital admission code (%)		
	Admitted†	Departed‡	Total (%)
Code frame result			
Admitted†			
Within hospital admission code	99.9	51.0	68.9
Departed‡			
Within hospital admission code	0.1	49.0	31.1
Total			
Within hospital admission code	100.0	100.0	100.0

†Admitted = ED appropriate presentation. ‡Departed = potential primary care presentation.

incentives are not significant enough to work in the after-hours period.[22]

In addition, general practices differ greatly in the services they can offer, ranging from solo practitioners to multi-practitioner health centres with onsite X-ray, practice nurses and allied health. While EDs will always continue to see potential primary care patients, especially where alternative facilities are not available, a robust method for calculating the exact impact potential primary care patients have on ED performance can help inform effective planning and policy decisions in the future. In areas where alternate facilities do exist, the code frame offers a tool that can be used at triage to redirect patients.

Strengths and limitations

Our code frame provides a workable standardised definition of a potential primary care patient and a standardised method to calculate how many ED attendances were considered safe to seen in primary care. This enables more accurate data estimations nationally and provides a tool for comparing international trends in both ED and primary care presentations. This type of analysis requires consistent methods to identify primary care appropriate presentations.

Adding the Speciality Triage Mode of Care adds an additional safety net to capture any patients who may have 'slipped through the cracks' through administrative error. For example, Table 1 shows two patients were coded as Trauma calls on the Specialty Mode of Care code. If only the ATS codes were being used, these patients would have been counted as potential primary care patients because they were actually miscoded as being lower urgency (ATS 4 or ATS 5). Although these presentations may well have been excluded by presenting problem, this criterion adds an additional filter to improve the sensitivity of the code frame.

Another strength is that the code frame uses the current presenting problem classifications utilised by ED staff when triaging patients. Considering the terminology that is already used by ED staff, the adoption of the code frame to prospectively identify

and divert potential primary care patients in future interventions should be acceptable to staff. Considering primary care appropriate presentations effect the within-hours period as much as the out-of-hours period, the code frame provides a valuable tool to do this.

The list of presenting problems in the code frame is based on the expert opinion of the Advisory Committee after reviewing presenting problem codes within the sample. The list is not an exhaustive one and other presentations may need to be added in future. The code frame would include patients requiring simple procedures such as an incision and drainage as primary care appropriate; however, it should be acknowledged that in some practice situations primary care doctors have less capacity to perform simple procedures, largely because of time constraints. Our definition of primary care appropriate as defined by our code frame may be less applicable in practice situations such as this.

Our aim was to devise a code frame that would capture patients who were primary care appropriate acknowledging that there will be inherent misclassification of a small number of cases that have somewhat unique characteristics and low frequency that the broad strokes of our code frame cannot capture. An example would be a procedure that required procedural sedation such as a simple fracture reduction, a condition that would not be primary care appropriate. While most cases would likely be excluded by triage category, there will still be some cases recorded as ATS category 4 or 5 and not excluded by any other component of the code frame.

Regardless of whether the code frame is used retrospectively or prospectively, it is limited by the ED staff's subjective assessment of each patient and their classification of the patient's presenting problem and triage category. In addition, individual patient perceptions and preferences that drive their use of EDs have not been taken into account and require qualitative studies.

The present study was limited to two public hospitals in Sydney. It is likely that these results are generalisable; however, testing across all EDs was beyond the scope of the study.

Conclusion

Our code frame provides a workable standardised definition of a potential primary care patient and a standardised method to calculate what proportion of ED attendances could potentially have been seen in a primary care setting. This will enable more accurate national data estimations, which are currently not available. It can be easily adapted to incorporate triage codes to use in international settings and provides a useful tool for comparing international trends in both ED and primary care presentations.

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Author contributions

HS and KE conceived the project and obtained funding. HS coordinated the project. RR and HS collected and analysed the data and drafted the manuscript. SA provided critical intellectual input in the clinical aspects of the code frame and ED data. KE provided critical intellectual input into the need for the code frame. All authors were involved in the formation of the code frame. All authors read and approved the final manuscript.

Competing interests

None declared.

References

1. Australian Institute of Health and Welfare. *Emergency department care 2014–15: Australian hospital statistics*. Canberra: Australian Institute of Health and Welfare, 2015.
2. Australian Bureau of Statistics. *3101.0 – Australian Demographic Statistics, Dec 2017*. Canberra: Australian Bureau of Statistics, 2018.
3. Forero R, McCarthy S, Hillman K. Access block and emergency department overcrowding. *Crit. Care* 2011; **15**: 216.
4. Fry MM. Barriers and facilitators for successful after hours care model implementation: reducing ED utilisation. *Australas. Emerg. Nurs. J.* 2009; **12**: 137–44.
5. Nagree Y, Ercleve TNO, Sprivulis PC. Afterhours general practice clinics are unlikely to reduce low acuity patient attendances to metropolitan Perth emergency departments. *Aust. Health Rev.* 2004; **28**: 285–91.
6. Durand AC, Gentile S, Devictor B *et al.* ED patients: how non-urgent are they? Systematic review of the emergency medicine literature. *Am. J. Emerg. Med.* 2011; **29**: 333–45.
7. Australasian College for Emergency Medicine. *Policy on the Australasian Triage Scale*. Melbourne: Australasian College for Emergency Medicine, 1993 [updated Jul 2013].
8. Australian Institute of Health and Welfare. *Australian Hospital Statistics 2012–13: Emergency Department Care*. Canberra: Australian Institute of Health and Welfare, 2013.
9. Nagree Y, Camarda VJ, Fatovich DM *et al.* Quantifying the proportion of general practice and low-acuity patients in the emergency department. *Med. J. Aust.* 2013; **198**: 612–5.
10. Australian Institute of Health and Welfare. *Australian Hospital Statistics 2013–14. Emergency Department Care*. Canberra: Australian Institute of Health and Welfare, 2014.
11. Siminski PM, Bezzina AJ, Lago LP, Eagar K. Primary care' presentations at emergency departments - rates and reasons by age and sex. *Aust. Health Rev.* 2008; **32**: 700–9.
12. Bezzina AJ, Smith PB, Cromwell D, Eagar K. Primary care patients in the emergency department: who are they? A review of the definition of the 'primary care patient' in the

emergency department. *Emerg. Med. Australas.* 2005; **17**: 472–9.
13. Webb P, Bain C, Pirozzo S. *Essential Epidemiology: An Introduction for Students and Health Professionals*, 9th edn. New York: Cambridge University Press, 2009.
14. Holdgate A, Morris J, Fry M, Zecevic M. Accuracy of triage nurses in predicting patient disposition. *Emerg. Med. Australas.* 2007; **19**: 341–5.
15. Alexander D, Abbott L, Zhou Q, Staff I. Can triage nurses accurately predict patient dispositions in the emergency department? *J. Emerg. Nurs.* 2016; **42**: 513–8.
16. Vaghasiya MR, Murphy M, O'Flynn D, Shetty A. The emergency department prediction of disposition (EPOD) study. *Australas. Emerg. Nurs. J.* 2014; **17**: 161–6.
17. Robertson-Steele IRS. Providing primary care in the accident and emergency department: the end of the inappropriate attender (Editorial). *BMJ* 1998; **315**: 409.
18. Buckley DJ, Curtis PW, McGirr JG. The effect of a general practice after-hours clinic on emergency department presentations: a regression time series analysis. *Med. J. Aust.* 2010; **192**: 448–51.
19. Durand AC, Palazzolo S, Tanti-Hardouin N, Gerbeaux P, Sambuc R, Gentile S. Nonurgent patients in emergency departments: rational or irresponsible consumers? Perceptions of professionals and patients. *BMC. Res. Notes* 2012; **5**: 525.
20. Cheek C, Allen P, Shires L, Parry D, Ruigrok M. Low-acuity presentations to regional emergency departments: what is the issue? *Emerg. Med. Australas.* 2015; **28**: 145–52.
21. Australian Bureau of Statistics. *4839.0 – Patient Experiences in Australia: Summary of Findings, 2015–16*. Canberra: Australian Bureau of Statistics, 2016.
22. Broadway B, Kalb G, Li J, Scott A. Do financial incentives influence GPs' decisions to do after-hours work? A discrete choice labour supply model. *Health Econ.* 2017; **26**: e52–66.