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ORIGINAL RESEARCH

Association between potential primary care emergency service and general practitioner care utilisation in New South Wales

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Abstract

Objective: To examine patterns of potential primary care (PPC) ED presentations and any association between PPC ED presentations and frequency of general practitioner (GP) care utilisation in New South Wales, Australia.

Methods: Retrospective cross-sectional study of 6 221 762 New South Wales patients who had at least one service in public hospitals, EDs or Medical Benefit Schedule claimable for GP service between 2013/2014 and 2014/2015 is conducted to examine association between PPC ED presentations and GP care utilisation using logistic regression adjusting for comorbidity index and a number of other covariates. Data over 2010/2011 to 2014/2015 are included for analyses of trends and patterns in PPC ED and GP care utilisation.

Results: Forty-one percent of the ED presentations were PPC ED presentations over the 5 years 2010/2011 to 2014/2015. Population rates of PPC ED presentations and GP care both increased over the period, with higher PPC ED presentation rates in regional areas, and higher GP care rates in major cities. GP care utilisation was associated with reduced odds for PPC ED presentations, with the adjusted odds ratios ranging from 0.28 for patients with one GP care service to 0.48 for patients with five or more GP care services compared with patients with none. Increased comorbidity index was also associated with increased risk of PPC ED presentations.

Conclusion: GP care utilisation was associated with reduced risk for any PPC ED presentations after adjusting for comorbidity index and the other factors.

Key words: *general practitioner care service, odds ratio, potential primary care ED (PPC ED) presentation.*

Key findings

- The study showed a high proportion of 41% ED presentations by NSW patients were PPC ED over 2010/11 to 2014/15; and there was a significant gradient association between frequency of GP care utilisation and reduced PPC ED presentation.
- The adjusted odds ratios for any PPC ED presentations in 2014/15 for patients with 1, 2, 3, 4 and 5 or more frequent GP care services in the two years of 2013/14 and 2014/15 were all less than half compared with patients without any recorded GP care during the period.
- The adjusted odds ratios for PPC ED presentations were also higher in young people, people living in regional areas in NSW, and patients with comorbidities.

Introduction

A common challenge facing health systems in Australia and throughout similar countries is the rising demand for emergency services.[1–3] The increase in emergency services has been over and above the rate of population growth in Australia.[4] The negative impact of overcrowding in ED in terms of poor patient outcomes has been broadly researched.[5,6] Population growth and an aging population with increasing health service demand and complex health conditions has been perceived as a major underlying driver for the increasing demand for the acute emergency services. Increasing low acuity ED presentations, often termed as general practitioner (GP)-type ED presentations, which we term as potential primary care (PPC) ED presentations in the present study, are also reported to have contributed moderately to the overall increase in emergency services.[4,7,8]

One recent New South Wales (NSW) study showed an elevated percentage of low acuity presentation to be associated with low GP density within a patients' local government area (LGA) of residence, among other demographic factors.[9] Another Canadian study using the

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linked Canadian Community Health Survey data with the National Ambulatory Care Reporting System data illustrated that self-reported access to a primary care physician is an important predictor for both the odds and rate of ED utilisation in Ontario, and a significant predictor for low severity emergency cases.[10] Monash University researchers examined the strategies to reduce avoidable presentations to EDs by older people by appropriately redirecting them to primary and community health services.[11] A UK study showed that access to convenient primary care services significantly reduces visits to hospital EDs.[12]

This existing research on the association between GP-type ED presentations and GP care utilisation either used patient self-reported measures for primary care physician access,[10] or used GP density at LGA level as a proxy for measuring primary care access by patients,[9] or using separate trends in PPC ED presentation and GP care utilisation using non-linked data.[8] There is a lack of direct measurement for the major study factor at patient level for analysing the magnitude of the association between the actual utilisation of the two type of services in the existing research, and the analyses had no adjustment for patient comorbidity status, which can be a significant confounder in the association, since patients with multiple co-existing health conditions tend to use more of both GP care and emergency services.

The main objectives of the present study is to examine any direct association between decreased PPC ED presentations with frequency of utilisation of GP care at patient level adjusting for patients' characteristics, including Charlson Comorbidity Index, patients' remoteness of residence, age group and sex.

Methods

Data source

This present study draws on the linked database created for the National Data Linkage Demonstration Project (NDLDP), the Hospitals-Medicare Benefits Schedule (MBS)-Pharmaceutical Benefits Scheme-National Death Index (NDI) linkage demonstration project under the auspices of Australian Health Ministers' Advisory Council. The NDLDP data linked data of public hospital admissions, ED presentations, MBS claims, Pharmaceutical Benefits Scheme data and NDI data for NSW and Victoria patients in Australia over the period of 2010/2011 to 2014/2015 (July 2010 to June 2015), with NDI over an extended period from July 2010 to December 2015. The Australian Bureau of Statistics estimated residential population for NSW in corresponding financial years was used to calculate population rate of service utilisation.

The NDLDP was approved by Australian Institute of Health and Welfare's (AIHW's) Ethics Committee (reference number EO 2016/3/307).

Study participants

The overall study group for trend and patterns of service utilisation consists of all NSW residents covered by linked NDLDP database over the period of July 2010 to June 2015, including their services in NSW and their cross-border services in Victoria, but not cross-border services in other states or territories in Australia. Data for a subgroup of 6 221 762 patients who had at least one service encounter in the linked Admitted Patient, ED and GP care recorded in MBS over the two financial years of 2013/2014 and 2014/2015 is used for the analyses of association between PPC ED presentations and GP services adjusting for the other factors.

Measurements

The specification for the outcome measure PPC ED presentations is a refinement on the Australian National Health Agreement indicator for 'Selected Potential Avoidable GP-type ED presentations' with the additional restriction that a PPC ED presentation is not referred by a GP,[13] with the criteria being: an emergency presentation, not a planned return presentation; triage category 4 (semi-urgent) or 5 (non-urgent) in the Australasian Triage Scale; not arrived by ambulance; not referred by a GP; not subsequently admitted to hospital and did not die in ED. Other ED presentations are termed as non-PPC ED presentations in the present study.

GP care services were identified from the MBS item groups and item numbers according to the indicator specification for primary care developed by the previous National Health Performance Authority.[14] GP care frequency in 2013/2014–2014/2015 was categorised into categories for 0, 1, 2, 3, 4 and 5 or more services.

Other study factors include categories of Charlson Comorbidity Index, remoteness of residence, age group and sex. The comorbidity index is broadly used for burden to predict adverse health outcomes.[15,16] The index ranging from 0 to 33 is derived from ICD-10-Australian Modification diagnosis codes in both principal and additional diagnosis codes, and further classified into three categories, 0, 1–2 and 3 and above, with 0 assigned to patients without a hospitalisation in the period. Remoteness was categorised by Accessibility and Remoteness Index of Australia mapped from postcodes of residence, with 0 to 0.2, 0.2 to 2.4, 2.4 to 5.92, 5.92 to 10.53 and above 10.53 for major cities, inner regional, outer regional, remote and very remote areas, respectively.

Analysis methods

Trends and patterns of PPC ED and GP care utilisation are described by remoteness of residence using the 5-year data. Patient level association between any PPC ED presentations and frequency of GP care utilisation is quantified using 6 221 762 patients' 2013/2014 and 2014/2015 data with multiple logistic regression modelling adjusting for comorbidity index category, remoteness, age group and sex. The shorter 2-year time period would mitigate the impact from instability of place of

TABLE 1. *Number and proportion of potential primary care (PPC) ED presentations in New South Wales residents by demographics over 2010/2011 to 2014/2015*

	PPC ED		Non-PPC ED		Overall	
	Presentations	%	Presentations	%	Presentations	%
Sex						
Female	2 451 113	41.9	3 392 860	58.1	5 843 973	100
Male	2 221 882	40.1	3 326 212	60.0	5 548 094	100
Age group (years)						
0–4	675 843	50.4	665 284	49.6	1 341 127	100
5–14	679 087	59.3	466 827	40.7	1 145 914	100
15–24	819 574	52.3	747 811	47.7	1 567 385	100
25–44	1 217 851	45.8	1 444 055	54.3	2 661 906	100
45–64	798 624	36.5	1 387 216	63.5	2 185 840	100
65–79	347 629	24.3	1 082 808	75.7	1 430 437	100
80+	134 320	12.7	924 619	87.3	1 058 939	100
Remoteness						
Major cities	2 784 687	38.1	4 531 623	61.9	7 316 310	100
Inner regional	1 383 362	46.3	1 603 865	53.7	2 987 228	100
Outer regional	484 502	46.8	550 116	53.2	1 034 618	100
Remote	16 422	38.0	26 823	62.0	43 244	100
Very remote	3273	35.8	5882	64.3	9155	100
Total	4 673 024	41.0	6 719 107	59.0	11 392 131	100

residence over a longer period, and the potential confounding effect of time on the association. SAS Enterprise Guide 7.11 was used for the data analyses.

Results

Over of 2010/2011 to 2014/2015, there were 11 392 131 ED presentations by 4 129 059 patients in NSW, an average of 2.8 presentations per patient. A high proportion of 41.0% of the ED presentations were PPC ED presentations. The younger population were over represented in PPC ED presentations along with patients living in regional NSW (Table 1).

PPC ED presentations and overall ED presentations have experienced steady increase over the 5 years, with the overall ED presentations increased by about 29% from 1.97 million presentations to 2.54 million, and 18% increase in PPC ED presentations, even though the proportions for PPC ED presentations dropped slightly from 43.4% in 2010/2011 and 41.9% in 2011/2012, and to 39.8% in 2014/2015.

Annual rates of PPC ED presentations per 1000 population increased across all regions in NSW at different pace, with the outer regional NSW consistently having the highest rates for PPC ED presentations from 187 to 266, followed by those in the inner regional NSW, from 170 to 212, and slight increase in major cities NSW from 100 to 102 (Fig. 1).

Population rates for GP care services also increased in NSW over 2010/2011 to 2014/2015, from 1092 to 1352 in major cities (24%), and from 863 to 1225 in inner regional areas (42%), and from 728 to 1105 for outer regional areas (52%) (Fig. 2).

The logistic regression modelling shows that GP care utilisation in the 2013/2014 and 2014/2015 was associated with less than half the odds for any PPC ED presentations in 2014/2015 after adjusting for other factors in the model, with the adjusted odds ratios ranging from 0.28 for patients with one primary care service event to 0.48 for patients with five or more primary care services compared with people with none. Being in the younger age groups, being male, living in regional NSW and having co-existing health conditions were all associated with higher probability for PPC ED presentations (Table 2).

Discussion

The present study shows a high proportion of about 41.0% of the ED presentations being PPC ED presentations in the 5-year period. GP care utilisation in the 2013/2014 and 2014/2015 was associated with less than half the adjusted odds for any PPC ED presentations in 2014/2015, with the odds ratios ranging from

TABLE 2. *Adjusted odds ratio (OR) for potential primary care ED presentation in 2014/2015 by frequency of general practitioner (GP) care utilisation and other factors among New South Wales (NSW) patients who had a service event in a NSW public ED or hospital, or had a GP care service during 2013/2014–2014/2015*

	OR	95% lower confidence limit	95% upper confidence limit
Age (years)			
0–4	1.45	1.43	1.46
5–14	1.53	1.52	1.54
15–24	1.43	1.42	1.44
25–44	1		
45–64	0.66	0.66	0.67
65–79	0.56	0.55	0.56
80+	0.42	0.42	0.43
Sex			
Female versus male	0.86	0.86	0.87
Remoteness			
Major cities	1		
Inner regional	1.90	1.89	1.91
Outer regional	2.20	2.18	2.22
Remote	1.31	1.26	1.36
Very remote	0.40	0.37	0.44
Charlson Comorbidity Index			
0	1		
1–2	1.42	1.41	1.44
3+	1.51	1.48	1.53
Number of primary care services			
0	1		
1	0.28	0.28	0.29
2	0.32	0.31	0.32
3	0.35	0.35	0.36
4	0.39	0.39	0.40
5+	0.48	0.47	0.48

0.28 for patients with one primary care service to 0.48 for patients with five or more GP care services compared with people with none. The magnitude of the odds ratios increasing with frequency of GP care utilisation could reflect some unadjusted residual confounding effect from patients with chronic conditions and complex needs of frequent use of either or both of GP care and emergency care services. Being in younger age groups, being male, living in regional NSW and having higher comorbidity index are also shown to be significantly associated with higher risk for PPC ED presentation, indicating elevated care needs for low acuity emergency services not being accounted for by frequency of GP care utilisation in these groups, which are worth further investigation.

The increasing trend in overall ED presentations and the proportion 41.0% for PPC ED presentations among all ED presentations are largely consistent with the range from 41% to 45% in a number of existing studies on trend in ED presentations and low acuity ED presentations.[4,8,17]

The association between reduced PPC ED and more frequent GP care found in the present study is in the consistent direction with those reported by some other existing studies of similar focus.[7–9] Furthermore, the present study is a unique study using direct patient level measurements of outcome and the major factor for frequency of GP care utilisation with adjustment for direct measurement for comorbidity and other demographic characteristics, which provided much more valid and stronger evidence for gradient association than using proxy measurements like patient self-reported GP care access level, or GP density at LGA of residence for GP access, or summarised GP visits data at NSW level without any adjustment for patient comorbidities.[7–9]

Data limitations of the present study include the possible slight under coverage of ED data in remote and very remote areas in early years on the trend analyses. The improved coverage of 2013/2014 and 2014/2015 ED data would minimise the potential impact on the adjusted odds ratios with the available linked data. Potential confounding effect of time on the association is also minimised by using this 2-year data only. Whether the lack of smaller, remote ED participation has impacted on the lower odds ratios for remote and very remote areas, or it was because of patient living in remote areas just not seeking ED care as much for low acuity conditions needs further investigation. The linked data only covered admissions to public hospitals, and hospitalisations in private hospitals were not included, this may lead to under-coding of comorbidity index.

There are still a lot of debates about the validity of different

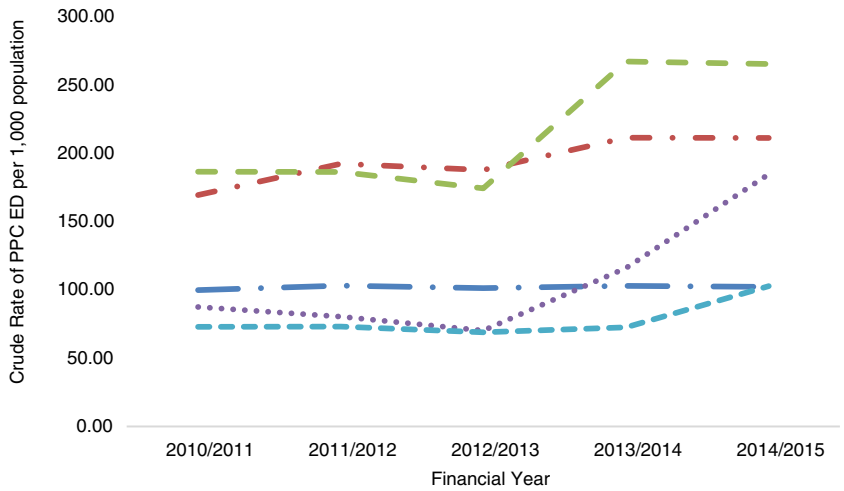

Figure 1. *Trend in crude rate of potential primary care ED presentations per 1000 population by remoteness. (——) Major cities; (– – –) inner regional; (– – –) outer regional; (· · ·) remote; (– – –) very remote.*

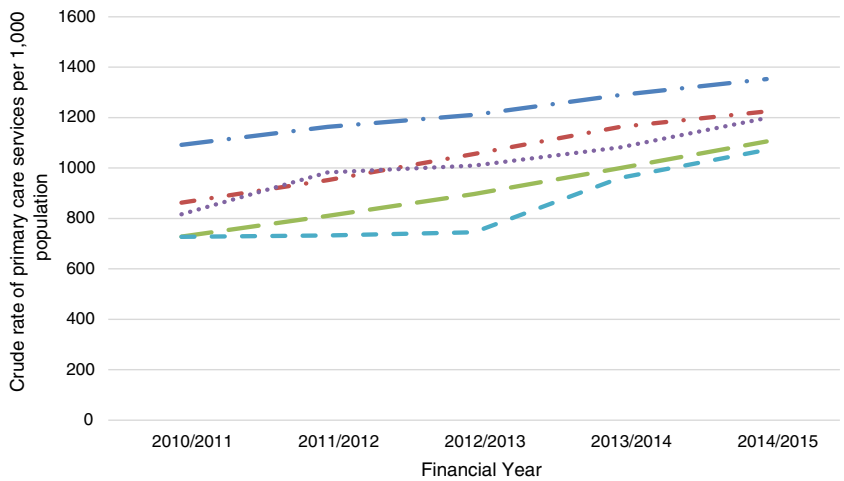

Figure 2. *Trend in crude rate of general practitioner care services per 1000 population by remoteness. (——) Major cities; (– – –) inner regional; (– – –) outer regional; (· · ·) remote; (– – –) very remote.*

versions of specification for true GP-type ED presentation,[9,18] and the AIHW specification is often regarded as overestimating for true GP-type ED presentations.[9,17] One recent study also revealed that, a large proportion of the low acuity ED presentation being injury/musculoskeletal conditions, some being mental health related.[19] Proportion of these services may not be managed properly by a GP. Specification for true GP-type ED presentations may be more complicated for rural and remote areas with a shortage of GPs. It is likely that many people appropriately self-refer to ED because they cannot access a GP.[18] Further research is required on the validation and improvement of different definitions to better capture true GP-type ED presentations.[7] The slightly refined PPC ED specification used in the present study is largely based on the AIHW specification. We acknowledge that it is likely to have captured more broad spectrum of ED presentations than true GP-type ED presentations. Nonetheless, the AIHW definition is a broadly used specification in Australia, the odds ratios of study factors for the refined PPC ED in the present study should still be useful to indicate the potential benefit of increasing the utilisation of GP care in reducing these low acuity PPC ED, including true GP-type ED presentations.

To increase utilisation of GP care for low acuity emergency care needs proves to be challenging. There have been some intervention studies to have looked at diverting patients to GPs or co-located clinics to reduce ED presentations with mixed results. Simple interventions like co-location of GP clinics to ED may not be enough, convenience, cost and trust of GP care quality may all play a part in the consideration for a patient to actually seek GP care than visit an ED.[12] More investigations are needed to better understand primary care needs of different PPC ED patient groups, such as children and young adults, and people with comorbidities, and their service seeking behaviour and barriers to GP care, be it GP clinics service hours, location of GP clinics, availability of telehealth for GP consultations, cost structure of Medicare rebate of GP consultations, availability of onsite pathology tests, enhanced targeted training for general practitioners in special clinical areas, with the aim to develop and provide appropriate patient centred high-quality primary care in an efficient setting.

Conclusion

The study showed a high proportion of 41% ED presentations by NSW patients were PPC ED over 2010/2011 to 2014/2015; and there was a significant gradient association between frequency of GP care utilisation and reduced PPC ED presentation. The adjusted odds ratios for any PPC ED presentations in 2014/2015 for patients with 1, 2, 3, 4 and 5 or more frequent GP care services in the 2 years of 2013/2014 and 2014/2015 were all less than half

compared with patients without any recorded GP care during the period. The adjusted odds ratios for PPC ED presentations were also higher in young people, people living in regional areas in NSW, and patients with comorbidities. These findings highlight the potential for service strategies and care innovations in improving appropriate GP care service utilisation, and other targeted interventions in high-risk areas and groups to reduce potentially avoidable PPC ED presentations.

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Author contributions

Both authors contributed equally to the design of the study. BY conducted the data analyses and drafted the manuscript. RM critically reviewed and revised the draft. BY finalised the manuscript. Both authors approved the version to be published and both authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Competing interests

None declared.

Data availability statement

The authors elect to not share data.

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