

GP services in Australia: presentation profiles during usual practice hours and after-hours periods

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Abstract. After-hours general practitioner (GP) services can reduce emergency department demand, which is currently increasing in Australia. Understanding GP after-hours care may assist in service planning. From April 2014 to March 2015, 986 GPs recorded 38 275 consultations with start and finish times in the Bettering the Evaluation and Care of Health (BEACH) study, a national, cross-sectional, representative study of GP activity. GP and patient characteristics and the content of encounters in usual-hours and after-hours were compared. Significantly more after-hours than usual-hours encounters were with: GPs aged 60+ years; in metropolitan practices; and practices with 10+ GPs. Patients seen after-hours were more often: male; aged 15–64 years; new to practice; and less likely to hold a Commonwealth Concession Card. They were more likely to be prescribed antibiotics and less likely to: have chronic problems managed; be referred; receive psycholeptic or psychoanaleptic prescription; and undergo a procedure. Throat symptoms, fever and injury were more common reasons for encounter, while infections and injury were more frequently managed problems after-hours. The patient mix, GP characteristics, problems managed and management actions in after-hours care differ from those in usual-hours care in Australia. This greater understanding of after-hours care is the first step to informed resource allocation to improve the delivery of after-hours primary care.

Additional keywords: after-hours care, primary health care.

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Introduction

In Australia, general practitioners (GPs) are usually the first point of healthcare contact and vital to managing disease and providing continuity of care. Increasingly, patients expect availability of 24-h care, presenting after usual practice hours to after-hours primary care services or to hospital emergency departments (ED) (Ifediora and Rogers 2017; Payne *et al.* 2017). The number of ED presentations increased by 67% from 4.5 million in financial year 2004–05 to 7.5 million in 2015–16 (Australian Institute of Health and Welfare 2009; Australian Institute of Health and Welfare 2016), with the rate of increase exceeding the rate of population growth (Payne *et al.* 2017). An estimated 10–40% of ED presentations represent clients who could be managed in primary care and detract ED services and resources from more urgent presentations (Payne *et al.* 2017).

While not all low-urgency presentations to ED could be seen appropriately by a GP, they are often used as a proxy for primary care-type visits. Establishment of two after-hours primary care clinics in rural towns in New South Wales, Australia, has been shown to reduce ‘low-urgency’ or ‘non-urgent’ presentations to nearby ED departments by 8% of all ED presentations (Buckley *et al.* 2010) or a 41% reduction in ‘non-urgent’ ED presentations

(Payne *et al.* 2017). Similarly, a patient self-report survey has demonstrated the potential for after-hours house-call services across Australia to reduce primary care-type presentations to ED (Ifediora and Rogers 2017). Similar reductions (9% of all ED presentations) have been reported overseas following establishment of after-hours GP cooperatives (van Uden and Crebolder 2004).

In Australia, female, older (aged 60+ years) and metropolitan GPs have been found to be less likely to work after-hours than their male, younger and rural counterparts respectively (Pham and McRae 2015). However, the proportion of female GPs and GPs aged ≥55 years has been found to be increasing in Australia over time, retaining GPs in rural areas is frequently difficult and a decrease in medical graduates choosing general practice has been observed (Charles *et al.* 2004). In general, female GPs have longer consultation times than their male counterparts (Britt *et al.* 2005), and those who do work after-hours work fewer hours (Pham and McRae 2015). Thus, in the future, the availability of GPs after-hours may be expected to decrease (Philips *et al.* 2010). The reduced availability of after-hours GP services increases the burden on GPs and may motivate patients to present to an ED rather than seeking after-hours primary care (Pham and McRae 2015).

Table 1. Distribution of recorded encounters

	<i>n</i> (%)
Day of week	
Monday	6786 (17.7)
Tuesday	9212 (24.1)
Wednesday	7950 (20.8)
Thursday	7854 (20.5)
Friday	5147 (13.5)
Saturday	987 (2.6)
Sunday	339 (0.9)
Time period	
Weekdays 8am–6pm (usual-hours)	35 828 (93.6)
Saturday 8am–12pm (usual-hours)	701 (1.8)
Weekdays 6–11pm (sociable after-hours)	832 (2.2)
Weekday nights 11pm–8am (unsociable after-hours)	275 (0.7)
Weekend after-hours (unsociable after-hours)	639 (1.7)

Understanding the unique characteristics of patients who present to after-hours primary care and the problems they present with is vital to effective delivery of services. To date, only one study in a single metropolitan GP clinic in Melbourne has compared patient and encounter characteristics in usual GP hours and after-hours practice (Turner *et al.* 2017). Four European studies have reported characteristics of out-of-hours consultations without comparison to usual GP practice (Huber *et al.* 2011; Huibers *et al.* 2011; Belche *et al.* 2014; Buja *et al.* 2015). There is a gap in the literature for a nationwide comparison of characteristics of GPs, practices, patients and encounters conducted in usual and after-hours GP care. We aim to fill this gap with this study and to identify differences in the most common patient reasons for encounter (RFE) and problems managed at consultations in usual and after-hours periods.

Methods

This study utilised data collected from April 2014 to March 2015 inclusive in the Bettering the Evaluation and Care of Health (BEACH) study. The data collection methods have previously been described (Britt *et al.* 2015a). In summary, each year, an ever-changing random sample of ~1000 recognised GPs each recorded details of 100 consenting-patient encounters on structured paper recording forms. The GPs recorded all details of the encounter including: the date of encounter and how it was paid; patient characteristics; up to three patient RFEs; up to four diagnoses/problems managed; and all management actions used at the encounter (each action being directly linked to the specific problem being managed).

Management actions included all medications (prescribed/supplied by the GP/advised for over-the-counter purchase), non-pharmacological treatments and procedures, referrals, pathology and imaging orders. RFEs and problems managed were classified according to the International Classification of Primary Care Version 2 (ICPC-2) (Classification Committee of the World Organisation of Family Doctors 1998). Certain ICPC-2 codes were grouped together to improve reliability, as previously described (Britt *et al.* 2015a). Medications were classified to the Anatomical Therapeutic Chemical (ATC) Classification System (WHO Collaborating Centre for Drug Statistics Methodology 2019).

On a separate form, GPs recorded details about themselves and their major practice, including its postcode. The geographic location of the practice was determined by the Australia Statistical Geographic Standard (Australian Bureau of Statistics 2018).

The BEACH study also ran sub-studies along the bottom of the encounter recording form. One such sub-study asked the GP to record the start and finish times of the encounter for 40 consecutive bespoke encounters.

Analyses for this study

The start times from this sub-study were used to categorise encounters into usual practice hours and after-hours periods (Australian Department of Human Services 2017). The following dates were classified as national public holidays: 18/21/25 April 2014, 25/26 December, 1/26 January and 3/6/25 April 2015.

We compared care that occurred within usual-hours and after-hours by:

- patient characteristics (age, sex, new to practice, Non-English-speaking background, Indigenous, holds a Commonwealth concession card)
- GP (age, sex, Fellow of the Royal Australian College of General Practitioners (FRACGP), Australian graduate)
- practice characteristics (rurality, size)
- content of encounters (number of problems managed, number of patient RFEs, same sex patient–GP dyad, medications, pathology tests, chronic problems, clinical treatments)
- patient RFEs
- problems managed.

Statistical analysis

The BEACH study has a single-stage cluster design with each GP having 100 patient encounters clustered around them. All point estimates were calculated using survey procedures in SAS 9.4 (SAS Institute Inc., Cary, NC, USA), which took the cluster design of the study into account to provide robust 95% confidence intervals (CIs). GP, patient and encounter characteristics were compared between usual practice hours and after-hours periods. Statistical difference was determined by non-overlapping 95% CIs. This method is a more conservative measure of difference than the usual α of 0.05 (Austin and Hux 2002).

Ethics approval

The BEACH program and all sub-studies have ethics approval and oversight from the Human Research Ethics Committee of the University of Sydney (protocol, 2012/130).

Results

Overall, 986 participating GPs recorded 98 600 patient-encounters, including 38 275 where the encounter start and finish times were recorded. Of these, 36 529 (95.4%) occurred within usual GP practice hours and 1746 (4.6%) in after-hours. Weekday encounters accounted for 97%, with highest frequencies on Tuesdays, Wednesdays and Thursdays (Table 1). Fourteen occurred during a national public holiday.

Compared with usual practice hours, larger proportions of after-hours encounters: were with GPs aged ≥ 60 years; took place in a metropolitan practice; and occurred in practices with 10 or more GPs (Table 2).

Table 2. Comparison of GP and patient characteristics, and content of encounters in usual GP hours and in after-hour periods, adjusted for GP clusters

CI, confidence interval; No, no significant difference between after-hours and usual-hours encounters; ↑, significantly greater percentage in after-hours than in usual-hours encounters; ↓, significantly lower percentage in after-hours than in usual-hours encounters

	Usual-hours (36 529 encounters)	After-hours (1746 encounters)	Significant difference? After-hours v. usual-hours
GP/practice characteristics	Per cent (95% CI)	Per cent (95% CI)	
Female GP	43.0 (39.8–46.1)	36.1 (27.9–44.3)	No
GP age (years)			
<45	27.0 (24.2–29.9)	18.5 (11.8–25.1)	No
45–59	44.9 (41.7–48.0)	37.6 (29.6–45.7)	No
≥60	28.1 (25.3–30.9)	43.9 (35.2–52.6)	↑
Has FRACGP	64.1 (61.0–67.1)	57.3 (48.7–65.9)	No
Australian graduate	67.0 (64.0–70.0)	67.2 (59.0–75.4)	No
Metropolitan (v. Rural)	70.7 (67.8–73.5)	80.9 (74.2–87.6)	↑
Large practice (10+ GPs)	28.5 (25.6–31.4)	41.5 (32.8–50.3)	↑
Patient characteristics			
Female patient	59.0 (58.0–60.0)	51.3 (48.5–54.0)	↓
Patient age (years)			
<15	6.6 (6.2–7.0)	8.5 (6.7–10.4)	No
15–24	5.3 (4.9–5.7)	8.5 (6.6–10.4)	↑
25–64	53.7 (52.6–54.8)	62.1 (58.7–65.5)	↑
≥65	34.4 (33.1–35.7)	20.9 (17.5–24.3)	↓
New patient to practice	6.6 (6.1–7.1)	14.5 (10.3–18.7)	↑
Non-English-speaking background	8.9 (7.6–10.1)	9.5 (5.9–13.2)	N
Aboriginal/Torres Strait Islander	1.8 (1.3–2.4)	0.9 (0.3–1.6)	N
Holds a Commonwealth Concession Card	45.6 (44.1–47.1)	35.0 (30.2–39.8)	↓
Consultation characteristics	Mean (95% CI)	Mean (95% CI)	
Number of problems managed	1.61 (1.59–1.63)	1.40 (1.35–1.45)	↓
Number of reasons for encounter	1.55 (1.54–1.57)	1.51 (1.46–1.55)	N
Number of pathology tests ordered	0.51 (0.49–0.53)	0.45 (0.38–0.52)	N
	Per cent of encounters (95% CI)	Per cent of encounters (95% CI)	
At least 1 referral at encounter	16.0 (15.4–16.5)	12.6 (10.6–14.6)	↓
GP same sex as patient	59.9 (58.9–60.9)	56.4 (53.8–59.0)	N
One or more chronic problems	41.9 (40.9–43.0)	32.3 (28.7–35.9)	↓
One or more clinical treatment provided	28.6 (27.2–30.0)	23.8 (19.8–27.8)	N
One or more procedures performed	18.6 (17.8–19.3)	14.9 (12.5–17.3)	↓
Medications (prescribed/advised for purchase over the counter/GP supplied)			
At least one medication at encounter	61.5 (60.6–62.4)	65.0 (61.6–68.4)	N
At least one antibiotic	12.6 (12.1–13.1)	19.3 (16.9–21.7)	↑
At least one psycholeptic/psychoanaleptic	8.8 (8.4–9.2)	6.6 (5.3–8.0)	↓
At least one opioid	5.3 (5.0–5.7)	5.4 (4.3–6.6)	N
At least one paracetamol	4.3 (4.0–4.7)	6.1 (4.2–8.1)	N

Compared with at encounters during usual-hours, greater proportions of after-hours encounters were with patients who were: male; aged 15–64 years; and new to the practice. Meanwhile, smaller proportions of after-hours encounters were with patients aged ≥65 years or with a Commonwealth Concession Card than within usual practice hours (Table 2). Significantly more problems were managed at encounters in usual practice hours, with a higher likelihood of referral and of procedural work than at after-hour encounters. Patients were also more likely to have at least one chronic problem managed during usual practice hours and were more likely to be prescribed a psycholeptic/psychoanaleptic medication. Conversely, patients were more likely to be prescribed an antibiotic at after-hours encounters than at usual-hours encounters.

The most common patient RFEs at usual-hours encounters were requests for: a check-up (any type); prescription(s); test

results; and presentations of cough and back complaints. At after-hours encounters, there were significantly higher rates of throat symptoms/complaints, fever, laceration/cut, and in terms of ICPC-2 components: symptoms and complaints and injuries (all types), than at encounters during usual-hours. Meanwhile, check-ups, test results, skin symptoms/complaints (not specified), neoplasms, diagnostic and preventive procedures, referrals and other RFEs not otherwise stated were recorded at higher rates at usual-hours than after-hours encounters (Table 3).

The most common problems managed at usual-hours encounters included hypertension, any type of check-up, acute upper respiratory tract infection (URTI), depression and diabetes. Similar to RFE findings, after-hours encounters had significantly higher management rates of acute URTI, laceration/cut, infections and injuries overall, than encounters in usual-hours. Conversely, after-hours encounters had significantly lower management rates

Table 3. Comparison of patient reasons for encounter (RFE) in usual GP hours and in after-hour periods: rate per 100 encounters of most common RFEs, and of all RFEs grouped by ICPC-2 component

CI, confidence interval; NOS, not otherwise stated; No, no significant difference between after-hours and usual-hours encounters; ↑, significantly higher rate of presentation in after-hours than in usual-hours encounters; ↓, significantly lower rate of presentation in after-hours than in usual-hours encounters

	Usual-hours (36 529 encounters)	After-hours (1746 encounters)	Significant difference? After-hours v. usual-hours
Reason for encounter	Rate per 100 encounters (95% CI)	Rate per 100 encounters (95% CI)	
Check-up – all ^A	13.71 (13.03–14.39)	8.45 (6.75–10.16)	↓
Prescription – all ^A	13.62 (12.82–14.41)	10.57 (8.15–13.00)	No
Test results ^A	9.74 (9.15–10.33)	6.74 (5.04–8.44)	↓
Cough	6.26 (5.73–6.78)	7.91 (5.82–9.99)	No
Back complaint ^A	3.40 (3.15–3.65)	3.88 (2.76–5.00)	No
Immunisation/vaccination – all ^A	3.36 (3.04–3.67)	2.15 (1.25–3.05)	No
Administrative procedure NOS	3.01 (2.75–3.27)	2.34 (1.12–3.57)	No
Throat symptom/complaint	2.78 (2.49–3.07)	6.49 (4.63–8.35)	↑
Rash ^A	2.72 (2.49–2.94)	4.02 (2.90–5.15)	No
Upper respiratory infection acute	2.19 (1.86–2.52)	1.75 (0.96–2.54)	No
Depression ^A	2.08 (1.87–2.30)	2.32 (1.39–3.24)	No
Abdominal pain ^A	2.02 (1.84–2.21)	2.24 (1.41–3.06)	No
Skin symptom/complaint other	1.77 (1.55–1.99)	0.70 (0.26–1.15)	↓
Fever	1.69 (1.47–1.92)	3.24 (1.97–4.51)	↑
Headache – all ^A	1.67 (1.49–1.86)	2.22 (1.44–3.00)	No
Weakness/tiredness general	1.54 (1.37–1.71)	2.47 (1.49–3.45)	No
Hypertension ^A	1.51 (1.26–1.77)	1.39 (0.54–2.24)	No
Anxiety ^A	1.44 (1.26–1.61)	1.73 (0.81–2.65)	No
Sneezing/nasal congestion	1.25 (1.05–1.45)	1.71 (0.79–2.63)	No
Pain ear/earache	1.20 (1.06–1.35)	1.91 (1.15–2.67)	No
Vertigo/dizziness	1.17 (1.03–1.31)	1.03 (0.55–1.50)	No
Diarrhoea	1.12 (0.98–1.26)	1.58 (0.83–2.34)	No
Foot/toe symptom/complaint	1.10 (0.97–1.22)	1.15 (0.54–1.75)	No
Pain chest NOS	0.84 (0.73–0.94)	1.17 (0.57–1.76)	No
Trauma/injury NOS	0.83 (0.72–0.95)	1.03 (0.49–1.58)	No
Injury musculoskeletal NOS	0.73 (0.61–0.84)	1.20 (0.60–1.80)	No
Laceration/cut	0.72 (0.60–0.83)	1.68 (0.99–2.38)	↑
Vomiting	0.69 (0.57–0.80)	0.99 (0.49–1.49)	No
Contraception female other	0.61 (0.50–0.72)	0.36 (0.04–0.68)	No
Pain general/multiple sites	0.48 (0.38–0.57)	1.06 (0.33–1.79)	No
Reason for encounter by ICPC-2 Component			
Symptoms and complaints	65.32 (63.36–67.28)	79.79 (71.97–87.60)	↑
Diagnoses and diseases	28.37 (26.90–29.84)	28.06 (23.64–32.47)	No
Infections	6.88 (6.37–7.39)	6.61 (5.09–8.13)	No
Injuries	3.89 (3.61–4.18)	6.27 (4.92–7.63)	↑
Neoplasms	1.05 (0.89–1.20)	0.41 (0.04–0.78)	↓
Congenital anomalies	0.21 (0.15–0.27)	0.26 (0.01–0.51)	No
Other diagnoses, diseases	16.01 (14.87–17.15)	14.51 (11.06–17.96)	No
Diagnostic and preventative procedures	23.86 (22.92–24.80)	16.26 (13.60–18.91)	↓
Medications, treatments and therapeutics	16.30 (15.45–17.14)	13.18 (10.51–15.84)	No
Results	9.74 (9.15–10.33)	6.74 (5.04–8.44)	↓
Administrative	3.41 (3.13–3.70)	3.11 (1.79–4.43)	No
Referrals and other RFEs	7.33 (6.84–7.81)	6.03 (3.50–8.56)	↓

^AIncludes multiple International Classification of Primary Care Version 2 (ICPC-2) or ICPC-2 PLUS codes.

of: check-up; test results; sleep disturbance; abnormal test results; solar keratosis/sunburn; malignant skin neoplasm; and in terms of ICPC-2 components: neoplasms; other diagnoses/diseases; symptoms and complaints; and diagnostic and preventive procedures, than usual-hours encounters (Table 4).

Discussion

This study provides a detailed comparison of the characteristics of GPs, their practices, patients and clinical content of encounters

conducted in usual GP hours of practice to those in after-hours periods of time. To our knowledge, it is the first study to directly compare these differences at a national level.

Most of the encounters within this study were recorded during weekdays (97%), consistent with the 99.5% reported by Turner *et al.* (2017), which may reflect practice closures during weekends. Only 4.6% of encounters were reported outside usual-hours, somewhat less than the 7.2% between 0 and 0800 hours reported in a Belgian out-of-hours clinic (Belche *et al.* 2014).

Table 4. Comparison of problems managed in usual GP hours and in after-hour periods: rate per 100 encounters of most common problems managed, and of all problems managed grouped by ICPC-2 component

CI, confidence interval; NOS, Not otherwise stated; RFE, reasons for encounter. No, no significant difference between after-hours and usual-hours encounters; ↑, significantly more often managed in after-hours than in usual-hours encounters; ↓, significantly less often managed in after-hours than in usual-hours encounters

	Usual- hours (36 529 encounters)	After-hours (1746 encounters)	Significant difference? After hours v. usual-hours
Problem managed	Rate per 100 encounters (95% CI)	Rate per 100 encounters (95% CI)	
Hypertension ^A	8.11 (7.57–8.65)	6.13 (4.61–7.64)	No
Check-up – all ^A	7.06 (6.62–7.51)	4.66 (3.40–5.91)	↓
Acute upper respiratory infection	5.75 (5.25–6.25)	8.24 (6.48–10.01)	↑
Depression ^A	4.32 (4.02–4.63)	3.54 (2.55–4.53)	No
Diabetes ^A	4.01 (3.71–4.31)	2.74 (1.64–3.85)	No
Immunisation/vaccination – all ^A	3.56 (3.22–3.90)	2.34 (1.45–3.23)	No
Back complaint ^A	3.27 (3.02–3.53)	3.45 (2.23–4.68)	No
Lipid disorders ^A	3.05 (2.74–3.36)	2.70 (1.67–3.72)	No
Osteoarthritis ^A	2.94 (2.67–3.20)	2.57 (1.46–3.67)	No
Prescription all ^A	2.92 (2.52–3.32)	3.40 (1.03–5.76)	No
Gastro-oesophageal reflux disease ^A	2.68 (2.45–2.90)	2.84 (1.97–3.71)	No
Test results ^A	2.24 (1.96–2.51)	1.01 (0.58–1.45)	↓
Anxiety ^A	2.21 (2.00–2.42)	1.71 (0.86–2.56)	No
Acute bronchitis/bronchiolitis	2.12 (1.90–2.34)	2.97 (1.33–4.61)	No
Asthma	1.94 (1.76–2.12)	1.47 (0.9–2.04)	No
Dermatitis, contact/allergic	1.86 (1.67–2.04)	1.90 (1.23–2.57)	No
Sleep disturbance	1.82 (1.64–2.01)	0.93 (0.47–1.39)	↓
Urinary tract infection ^A	1.75 (1.59–1.91)	1.69 (1.09–2.29)	No
Vitamin/nutritional deficiency	1.35 (1.18–1.52)	1.00 (0.46–1.55)	No
Abnormal test results ^A	1.32 (1.17–1.48)	0.70 (0.33–1.07)	↓
Administrative procedure NOS	1.32 (1.13–1.51)	1.23 (0.15–2.31)	No
Atrial fibrillation/flutter	1.30 (1.13–1.48)	0.72 (0.25–1.19)	No
Solar keratosis/sunburn	1.27 (1.11–1.44)	0.25 (–0.05–0.55)	↓
Sinusitis acute/chronic	1.23 (1.08–1.38)	1.41 (0.67–2.15)	No
Malignant neoplasm of skin	1.23 (1.04–1.41)	0.63 (0.28–0.99)	↓
Headache ^A	1.21 (1.07–1.36)	1.45 (0.88–2.02)	No
Pregnancy ^A	1.20 (1.01–1.40)	1.27 (0.61–1.94)	No
Sprain/Strain ^A	1.19 (1.05–1.33)	1.34 (0.71–1.97)	No
Gastroenteritis ^A	1.19 (1.04–1.33)	1.72 (0.90–2.53)	No
Ischaemic heart disease ^A	1.19 (1.04–1.34)	0.65 (0.18–1.12)	No
Bursitis/tendonitis/synovitis NOS	1.14 (1.01–1.27)	0.62 (0.21–1.03)	No
Oral contraception ^A	1.07 (0.94–1.20)	1.16 (0.56–1.75)	No
Skin disease, other	1.04 (0.91–1.17)	0.79 (0.31–1.27)	No
Viral disease, other/NOS	1.03 (0.82–1.23)	1.63 (0.68–2.59)	No
Injury musculoskeletal NOS	1.01 (0.87–1.15)	0.68 (0.26–1.11)	No
Osteoporosis	0.93 (0.80–1.06)	0.57 (0.17–0.97)	No
Acute otitis media/myringitis	0.92 (0.79–1.05)	1.90 (1.02–2.77)	No
Laceration/cut	0.91 (0.78–1.04)	1.92 (1.16–2.67)	↑
Problems managed by ICPC-2 component			
Diagnoses, diseases	102.52 (100.39–104.66)	95.94 (90.42–101.45)	No
Infections	22.93 (22.07–23.79)	29.49 (26.08–32.89)	↑
Any injury	4.82 (4.54–5.11)	6.88 (5.54–8.22)	↑
Neoplasms	4.78 (4.41–5.15)	2.18 (1.41–2.94)	↓
Congenital anomalies	0.64 (0.54–0.75)	0.55 (0.15–0.96)	No
Other diagnoses, diseases	67.21 (65.09–69.32)	55.35 (49.01–61.68)	↓
Symptoms and complaints	31.48 (30.46–32.50)	24.71 (21.82–27.61)	↓
Diagnostic and preventative procedures	13.71 (12.99–14.42)	10.05 (8.20–11.90)	↓
Medications, treatments and therapeutics	4.33 (3.90–4.77)	4.80 (2.38–7.22)	No
Results	2.24 (1.96–2.51)	1.01 (0.58–1.45)	↓
Administrative	1.47 (1.26–1.67)	1.85 (0.68–3.02)	No
Referrals and other RFEs	1.34 (1.11–1.56)	1.92 (0.0–4.20)	No

^AIncludes multiple International Classification of Primary Care Version 2 (ICPC-2) or ICPC-2 PLUS codes.

This may be partially explained by the Belgian clinic being a dedicated clinic for out-of-hours care. Only 14 encounters were reported in our study over 10 national public holiday dates (0.04%), fewer than at other times of the year. This might reflect a general tendency for GP practices to be closed over public holidays and/or for patients to assume a lack of primary care services and just attend an ED instead. This is supported by previous reports of a surge in non-urgent ED presentations that could have been managed by GPs over the Christmas and New Year holiday period in New South Wales, Australia (Zheng *et al.* 2007). It may also be due to the BEACH study not actively recruiting GPs to start over the 2-week period that includes Christmas, Boxing Day and New Year's Day.

Compared with usual-hours of practice, a significantly higher proportion of after-hours encounters were with GPs aged ≥ 60 years. A possible explanation may be that older GPs have less need to pursue a work-family life balance. Research indicates that only 63% of GPs aged 45–65 years in Australia intend to continue working past the age of 65 years; the majority stating poor job satisfaction, bureaucracy and disillusionment with the medical system as disincentives to working in general practice (Brett *et al.* 2009). Furthermore, an increase in the proportion of GPs aged ≥ 55 years and a decrease in the proportion aged 35–44 years was observed in Australia over the decade 2005–06 to 2014–15 (Britt *et al.* 2015b). As many of the GPs currently providing after-hours care are planning to retire early, this has implications for a shortage of after-hours care providers in the near future unless incentives are provided for younger GPs to provide this care.

We also found a significantly higher proportion of after-hours encounters were in practices with 10 or more GPs, and in metropolitan rather than rural areas. This suggests it is easier to provide after-hours services in large GP practices and in settings where multiple local practices can pool after-hours care so that the workload is spread across more GPs.

Female patients accounted for a significantly smaller proportion of attendees in after-hours (51%) than in usual-hours (59%) care, as did patients aged ≥ 65 years, perhaps reflecting a preference of patients to see their usual healthcare practitioner. The roughly 50/50 split in gender of patients seen at after-hours encounters differed from the gender split found in other studies; 54% being female in Melbourne (Turner *et al.* 2017) and 52–66% across eight European countries (Huber *et al.* 2011; Huibers *et al.* 2011; Buja *et al.* 2015). Different healthcare systems and patient expectations overseas may explain these differences.

Male patients, those aged 15–64 years and patients new to the practice accounted for a larger proportion during after-hours. This reflects previous findings that males aged 15–44 years are more likely to not have a regular GP and to be new to the practice than females in the same age bracket (Bayram *et al.* 2016), thus accounting for larger proportions of male and new patient encounters after-hours than during usual-hours. Both URTI and musculoskeletal problems are commonly managed problems for male patients (Bayram *et al.* 2016), contributing to findings of higher rates of acute URTI and injury managed in after-hours periods. Patients aged 15–64 years might be more likely to present after-hours due to being occupied with work or study during usual-hours of practice. Furthermore, this age

group may be less likely to hold a Commonwealth Concession Card than older patients, contributing to the larger proportion of after-hours encounters with patients without a Commonwealth Concession Card.

We found that, on average, fewer problems were managed at after-hours encounters and a smaller proportion of after-hours encounters involved one or more chronic problems. This suggests that patients are being managed more frequently for one non-chronic problem after-hours as opposed to multiple chronic problems within usual-hours. Patients were more likely during usual-hours to receive a referral (to an ED, to hospital, to a specialist or allied health professional) or to undergo a procedure than in after-hours encounters. This is consistent with findings of a greater number of problems managed and higher likelihood of one or more chronic problems being managed during usual-hours, necessitating a referral or procedure.

Similar to previous findings, our study found that antibiotics were more commonly prescribed after-hours than at encounters in usual-hours (Turner *et al.* 2017). This seems plausible given a higher rate of acute infections being managed after-hours, as well as social pressures to prescribe after-hours in response to patient or familial distress (Turner *et al.* 2017). Our study found a lower rate of psycholeptic/ psychoanaleptic prescription in after-hours care than within usual-hours; however, no difference was observed in encounter rates for depression or anxiety between after-hours and usual-hours. This may reflect that a patient's regular GP is more comfortable prescribing a psycholeptic/psychoanaleptic as a result of being familiar with the patient's medical history.

We found a broad spectrum of RFEs at both usual-hours and after-hours encounters in this study, which is common for primary care (Huber *et al.* 2011; Buja *et al.* 2015). Non-acute presentations for check-up and test results were more common during usual-hours. Consistent with findings from a Swiss study examining RFE rates in an out-of-hours clinic, we found that acute problems such as fever, throat symptoms, lacerations and any injury were among the most common RFEs after-hours (Huber *et al.* 2011). The most common problems managed corresponded well with the most common RFEs in each time period. Within usual-hours, check-ups, test results and skin problems (specifically solar keratosis and neoplasm) were more common, and URTI and any injury were more common after-hours. Other studies that examined after-hours diagnoses grouped these into ICPC-2 chapters, thus making a direct comparison difficult (Huibers *et al.* 2011; Belche *et al.* 2014; Turner *et al.* 2017).

Strengths of this study include the large sample size of GPs nationwide and total number of encounters compared with similar studies. The response rate of GPs to the BEACH study was 29%, relatively high for quite a labour-intensive GP study, and annual checks have found the sample of participating GPs to be representative of the practising GPs in the community (Britt *et al.* 2015a). While several years old now, no other Australian dataset could produce results that are as complete, reliable and representative as those from the BEACH study. However, participating GPs were asked to start recording encounters on a Tuesday and may have finished before the weekend; therefore, the small proportion of encounters recorded during weekends may be an underestimate of actual rates in the community. There is also the

possibility that some GPs providing after-hours care may not record these encounters, due to factors such as fatigue. This study demonstrates a difference in the patient mix, GP characteristics, clinical problems managed and management actions between after-hours and usual-hours consultations in Australia. Patients are generally younger and more likely to have acute problems managed after-hours. After-hours GP services are the first port of call to alleviate the burden of low urgency presentations to an ED. Given the sizeable proportion of ED presentations that could be managed by after-hours primary care services and the significant cost difference between these types of services, this has important implications for reducing the strain on healthcare funding. However, workforce shortages appear likely in the near future as older GPs retire, unless incentives are provided for younger GPs to work after-hours and for patients to present to after-hours GP services for low urgency problems.

Conflicts of interest

The authors declare no conflicts of interest.

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