Paediatric care in general practice:
Case mix, referral patterns and healthcare costs

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Background and objective
There are no contemporary data to describe which paediatric conditions general practitioners (GPs) see, which conditions they refer, and where and whether referrals differ by general practice, patient or GP factors. A better understanding of the this could inform GP training needs and workforce planning. The aim of this study was to address knowledge gaps around the case mix of general practice paediatric consultations, as well as GP referral patterns, associated factors and costs.

Methods
A cross-sectional analysis of 49,932 paediatric consultations was performed across 22 general practices in Victoria and New South Wales involving 130 GPs. General practice electronic medical records were analysed to determine consultation reasons and referrals.

Results
Common reasons for visits included medical issues, immunisations, developmental–behavioural concerns, check-ups and mental health. GPs referred 10% of visits, predominantly for mental health. Referral patterns were associated with private billing, GP demographics, patient characteristics and years of working in general practice. Most referrals were to private specialists. Estimated costs to the healthcare system were $1.39 million.

Discussion
GPs mostly refer to private specialists for mental health and developmental–behavioural concerns, particularly with private billing, indicating access disparities. Increased public sector capacity for these conditions is needed. Strengthening paediatric primary care could yield significant cost savings by reducing referrals.

GENERAL PRACTITIONERS (GPs) provide most healthcare to Australian children,[1] referring to public and private specialists. However, wait times to be seen in hospital emergency departments (EDs) and outpatient clinics for paediatric care are increasing.[2] Similarly, private paediatricians report long wait times or closing their books, especially to children with developmental–behavioural concerns.[3] The burden of this care likely falls back on GPs, but we have no contemporary data to describe which paediatric conditions GPs see, which conditions they refer (and where) and whether referrals differ by general practice, patient or GP factors. We also do not understand the cost implications of GP paediatric referrals to the healthcare system.

A better understanding of who GPs care for, who they refer and for what reasons could inform GP training and broader system reform aimed at strengthening the comprehensive healthcare of Australian children close to home. Further, it could help identify any inequity in access to specialist care, informing new models of care to optimise access for all children.

Therefore, the aims of this study, performed in 22 general practices from Victoria and New South Wales (NSW), were to describe: the case mix of children aged between 0 and <18 years attending GPs (Aim 1); patterns of GP referrals for children (Aim 2); practice, GP or patient factors associated with referrals (Aim 3); and costs to the healthcare system (Aim 4).

Methods

This paper draws on baseline data from the Strengthening Care for Children (SC4C) trial (Australia New Zealand Clinical Trials Registry 12620001299998).[4] Briefly, we recruited within the catchment areas of the North Western Melbourne Primary Health Network in Victoria and the Central Eastern Sydney Primary Health Network in NSW. These primary health networks had high paediatric referral rates to local children's hospitals and were interested in participating in the study. Participating general practices needed to be accredited by the Royal Australian College of General Practitioners (RACGP) or working towards accreditation, have 900 or more paediatric patients attending the practice in the last 12 months and sign a licence agreement to install the software clinical data extraction tool, GRHANITE™, in their electronic medical record (EMR).[4] GRHANITE enabled the extraction

of de-identified, routinely collected data, including patient demographics (sex, age, socioeconomic status based on Socio-Economic Indexes for Areas [SEIFA] quintile), reason for visit, consultation length and Medicare item billing. GP referrals are not consistently recorded in EMRs; therefore, the GRHANITE team developed a tailored pop-up window for Victorian and NSW locations (Appendix 1, available online only), displaying referral outcomes that GPs completed following each paediatric consultation. This pop-up window featured the most common referral options, including no referral or referral to public or private services. GPs completed a baseline survey measuring demographics, number of years in practice, number of children seen per week, any formal training in paediatrics, factors influencing their decision to refer children and their use of HealthPathways (an online information portal for primary healthcare providers).

For Aim 1, 'reason for visit' was categorised based on a previous pilot[5] by two of the authors who are paediatricians (HH, RL). A natural language processing algorithm was then developed with The University of Melbourne to automatically transform general practice EMR clinical text of 'reason for visit' or diagnosis into structured clinical data, based on Systematized Nomenclature of Medicine Clinical Terminology (SNOMED CT).[6] Where we found abbreviations and misspellings (eg upper respiratory tract infection, URTI, upper resp infection), two paediatricians reviewed these and then determined how they best mapped to available SNOMED CT codes using the CSIRO OntoServer system from the Australian National Clinical Terminology Service.[7] The following categories were developed: medical; developmental–behavioural; immunisation; mental health; and encounter for check-up. For each category, we calculated the frequency and proportion of clinic visits. Within each category, we then calculated the top 10 conditions encountered, the length of clinic visit (median and interquartile range [IQR]), the most frequent Medicare billing item number and the number and percentage of consultations that resulted in a referral.

For Aim 2, we calculated the number and proportion of consultations where the patient was referred and their referral destination overall, as well as by reason for visit. Referral destinations were collapsed across the two states into public ED, public outpatient, other public hospital, private hospital, private specialists, public mental health services, allied health and other.

For Aim 3, we described the associations between general practice, GP and patient factors and the likelihood of referrals using risk ratios (RRs) and 95% confidence intervals (CIs) calculated using univariate mixed effects Poisson regression with robust error variance. Each model includes a random effect for GP and general practice to allow for clustering in data. GP practice factors included practice billing type for paediatric patients (ie private [no patients offered bulk billing], mixed private and bulk billing and bulk billing only). GP factors included sex, years of practice, number of children seen per week, prior formal paediatric training, use of HealthPathways and factors influencing the decision to refer a paediatric patient. Patient factors included age, sex and socioeconomic status. Statistical analyses were conducted using Stata 16.0.

For Aim 4, we applied a frequency and unit cost to each referral identified in Aim 2. Frequencies of specialist visits were obtained from analysing population Medicare data from the Longitudinal Study of Australian Children for number of initial child specialist visits in a year and the number of review visits in a year.[8] The mean number of psychologist visits was taken from Hiscock et al,[8] with allied health visits assumed to be the same. For each visit, a unit cost associated with a closely aligned Medical Benefits Schedule item number[9] was applied. The number of referrals was multiplied by the mean number of visits and unit cost to produce a total cost. A sensitivity analysis was performed modifying the proportion of children who would take up that referral. Costs are reported in 2023 Australian dollars.

This study was approved by The Royal Children's Hospital Ethics Committee (August 2020; Project ID: 65955) and site-specific human research ethics committees.

Results

Of the 22 general practices, 15 (68.2%) were bulk billing, four (18.2%) were mixed billing and three (13.6%) were exclusively private billing. A median of 5.5 (minimum 3 to maximum 12) GPs per practice consented to participate. The characteristics of the participating GPs are presented in Table 1. Compared with GPs in non-participating practices in the two primary health networks, more female GPs participated in in our trial (58% vs 51%) and a lower percentage of GPs had been practising for more than 15 years (36% vs 58%). There was no difference

Table 1. Characteristics of 130 general practitioners in metropolitan Melbourne and Sydney consenting to participate in the Strengthening Care for Children Trial

Sex	
Male	47/112 (41.96)
Female	65/112 (58.04)
No. missing observations	18
Years of practice	
<6	24/111 (21.62)
6–15	47/111 (42.34)
>15	40/111 (36.04)
No. missing observations	19 observations
Mean no. paediatric patients seen per week	
<11	19/111 (17.12)
11–20	46/111 (41.44)
>20	46/111 (41.44)
No. missing observations	19
Formal paediatric healthcare training	
Yes	31/111 (27.93)
No	80/111 (72.07)
No. missing observations	19
Use HealthPathways	
Strongly disagree	16/110 (14.55)
Disagree	47/110 (42.73)
Agree	41/110 (37.27)
Strongly agree	6/110 (5.45)
No. missing observations	20

Unless indicated otherwise, data are presented as n/N, with percentages of the total number of observations available for a given characteristic presented in parentheses.

in practice socioeconomic status (based on SEIFA of practice postcodes) between practices that did and did not participate.

Aim 1: Case mix of children aged between 0 and <18 years attending general practices

The total number of clinic visits from 1 May 2021 to 31 March 2022, as well as visit characteristics, are presented in Table 2. Of 49,932 consultations, medical issues were the most frequent reason for the visit (n=29,289), followed by immunisations (n=7745), developmental–behavioural (n=1170), encounter for check-up (n=1143) and mental health (n=888). In terms of referrals by reason for visit categories, GPs most commonly referred for mental health problems (33.7% of all mental health consultations) followed by developmental–behavioural concerns (26.8%).

Aim 2: Referral numbers, proportions of consultations and destination

Referral destinations according to the reason for visit category and according to the top five reasons for the visit within each category are presented in Table 3. GPs referred 4420 of 43,301 (10.2%) children. Within the mental health and developmental–behavioural reason categories, most referrals were to private specialists, especially for attention deficit hyperactivity disorder (40.0% of consultations referred to private specialist), behaviour problems (37.1%), anxiety (31.1%) and autism spectrum disorder (26.9%). Referrals to allied health were common for speech delay and behaviour problems. Referrals to hospital clinics or to EDs were uncommon (2.4%).

Table 2. Case mix of children aged 0–18 years attending general practices across 22 general practices in metropolitan Melbourne and Sydney

	Frequency	Median [IQR] length of visit (min)	Most frequent MBS item	No. referrals (n/N,%)
All clinic visits	49,932	16.1 [9.3–30.7]	10990	4420/43,301 (10.2)
Medical	29,289	16.1 [9.9–30.5]	10990	2703/25,621 (10.5)
Upper respiratory tract infection	2330	14.2 [9.6–23.6]	10990	44/2007 (2.2)
Review	1632	15.2 [8.9–37.8]	10990	125/1460 (8.6)
Cough	858	16.8 [11.0–31.7]	10990	20/755 (2.6)
Advice and listening	774	14.1 [8.6–25.5]	10990	26/737 (3.5)
Eczema	752	16.0 [9.8–29.3]	10990	43/672 (6.4)
Follow-up	527	33.0 [14.9–57.3]	10990	29/493 (5.9)
Results discussed	484	26.3 [11.4–63.1]	10990	18/440 (4.1)
Constipation	362	18.8 [12.6–33.3]	10990	20/329 (6.1)
Asthma	361	17.3 [10.5–31.4]	10990	17/301 (5.6)
Fever	360	16.9 [11.0–30.8]	10990	15/305 (4.9)
Developmental–behavioural	1170	21.6 [12.4–38.7]	10990	270/1007 (26.8)
Parental concern	92	25.4 [14.6–85.0]	10990	5/82 (6.1)
Teething	90	19.2 [13.4–42.3]	10990	1/82 (1.2)
Gastroesophageal reflux disease	85	21.1 [14.1–35.7]	10990	6/66 (9.1)
Speech delay	67	26.4 [15.2–60.5]	10990	30/63 (47.6)
Behaviour problem	45	31.7 [20.4–54.6]	10990	20/35 (57.1)
Reflux – gastroesophageal	43	17.2 [10.9–31.0]	10990	4/36 (11.1)
Insomnia	41	22.3 [7.7–40.1]	10990	12/37 (32.4)
Unsettled baby	39	28.6 [17.2–37.4]	10990	4/36 (11.1)
GP mental health plan (721) and team care arrangement (723) – completed in same consult	32	25.5 [19.0–39.7]	10990	23/28 (82.1)
Sleep – abnormal	25	18.3 [14.0–33.0]	10990	8/23(34.8)

Table continued on the next page

Table 2. Case mix of children aged 0–18 years attending general practices across 22 general practices in metropolitan Melbourne and Sydney (cont'd)

	Frequency	Median [IQR] length of visit (min)	Most frequent MBS item	No. referrals (n/N,%)
Immunisation	7745	16.7 [8.4–30.4]	10990	248/6925 (3.6)
Influenza immunisation	1328	12.5 [7.9–20.7]	10990	26/1179 (2.2)
Immunisation	722	19.9 [10.9–35.5]	10990	21/656 (3.2)
12-month immunisation	358	21.6 [12.4–37.3]	10990	7/339 (2.1)
Vaccination	351	20.5 [9.6–39.4]	10990	7/297 (2.4)
18-month immunisation	350	21.5 [12.8–34.9]	10990	11/324 (3.4)
4-month immunisation	341	23.8 [14.1–39.3]	10990	15/325 (4.6)
4-year immunisation	324	16.1 [9.6–27.5]	10990	13/309 (4.2)
6-month immunisation	315	20.0 [10.9–36.7]	10990	11/303 (3.6)
6-week immunisation	215	28.8 [20.3–46.8]	10990	16/202 (7.9)
Immunisation enquiry	166	27.6 [10.7–60.8]	10990	0/160 (0.0)
Mental health	888	22.2 [11.9–38.9]	10990	258/765 (33.7)
Anxiety	131	24.3 [14.8–38.4]	10990	42/103 (40.8)
Attention deficit hyperactivity disorder	117	15.2 [8.6–28.2]	10990	47/95 (49.5)
Phone advice	89	9.1 [4.4–22.3]	10990	16/78 (20.5)
Anxiety/depression	80	25.3 [19.0–51.9]	10990	23/74 (31.1)
Autism spectrum disorder	55	20.8 [14.0–41.8]	10990	18/52 (34.6)
Depression	54	25.3 [19.6–38.8]	10990	13/45 (28.9)
Mental health consult	43	32.5 [22.1–43.4]	10990	14/33 (42.4)
Anorexia nervosa	33	10.2 [7.8–30.9]	23	6/27 (22.2)
Eating disorder	24	41.9 [21.2–132.5]	10990	12/23 (52.2)
Parental anxiety	10	34.5 [24.3–57.9]	10990	0/8 (0.0)
Check-up	1143	24.1 [13.4–46.9]	10990	57/1023 (5.6)
Check-up	234	20.5 [13.5–32.7]	10990	10/211 (4.7)
6-week neonatal check	178	43.1 [25.5–82.6]	10990	5/163 (3.1)
Ear check	142	19.1 [10.3–34.8]	10990	7/130 (5.4)
Weight check	87	15.3 [8.1–32.0]	10990	6/76 (7.9)
Neonatal examination	53	50.0 [29.7–84.1]	10990	2/48 (4.2)
Well infant check-up	51	21.3 [12.8–29.5]	23	1/43 (2.3)
Health check, child	39	28.6 [20.2–44.4]	10990	1/35 (2.9)
Skin check	33	28.3 [15.1–86.2]	10990	4/29 (13.8)
Eye check	19	39.7 [20.1–54.5]	10990	0/18 (0.0)
Wound check	18	12.7 [6.0–31.0]	10990	0/15 (0.0)

IQR, interquartile range; MBS, Medicare Benefits Schedule.

Table 3. Referral disposition by reason for visit category and by the top five reasons for visit within each category

Reason for visit	Total no. visits	Public ED	Public outpatient	Other public hospital	Private hospital	Private specialist	Public mental health	Allied health	Other
Any	43,301	303 (0.7)	669 (1.5)	16 (0.0)	38 (0.1)	2314 (5.3)	38 (0.1)	486 (1.1)	791 (1.8)
Medical	25,621	241 (0.9)	407 (1.6)	12 (0.0)	21 (0.1)	1371 (5.4)	20 (0.1)	278 (1.1)	483 (1.9)
Advice and listening	737	1 (0.1)	9 (1.2)	0 (0.0)	0 (0.0)	10 (1.4)	0 (0.0)	3 (0.4)	4 (0.5)
Cough	755	5 (0.7)	1 (0.1)	0 (0.0)	0 (0.0)	8 (1.1)	0 (0.0)	0 (0.0)	6 (0.8)
Eczema	672	2 (0.3)	11 (1.6)	0 (0.0)	1 (0.1)	16 (2.4)	0 (0.0)	3 (0.4)	10 (1.5)
Review	1460	5 (0.3)	30 (2.1)	0 (0.0)	1 (0.1)	46 (3.2)	1 (0.1)	9 (0.6)	38 (2.6)
Upper respiratory tract infection	2007	6 (0.3)	5 (0.2)	0 (0.0)	0 (0.0)	7 (0.3)	0 (0.0)	2 (0.1)	24 (1.2)
Developmental–behavioural	1007	5 (0.5)	32 (3.2)	0 (0.0)	5 (0.5)	139 (13.8)	3 (0.3)	87 (8.6)	23 (2.3)
Behaviour problem	35	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	13 (37.1)	0 (0.0)	6 (17.1)	2 (5.7)
Gastroesophageal reflux disease	65	2 (3.1)	1 (1.5)	0 (0.0)	0 (0.0)	4 (6.2)	0 (0.0)	0 (0.0)	0 (0.0)
Parental concern	82	0 (0.0)	1 (1.2)	0 (0.0)	0 (0.0)	2 (2.4)	0 (0.0)	1 (1.2)	2 (2.4)
Speech delay	63	0 (0.0)	2 (3.2)	0 (0.0)	0 (0.0)	9 (14.3)	0 (0.0)	19 (30.2)	4 (6.3)
Teething	82	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Immunisation	6925	1 (0.0)	49 (0.7)	0 (0.0)	3 (0.0)	136 (2.0)	0 (0.0)	16 (0.2)	56 (0.8)
12-month immunisation	339	0 (0.0)	5 (1.5)	0 (0.0)	0 (0.0)	3 (0.9)	0 (0.0)	0 (0.0)	1 (0.3)
18-month immunisation	324	0 (0.0)	2 (0.6)	0 (0.0)	0 (0.0)	7 (2.2)	0 (0.0)	1 (0.3)	1 (0.3)
Influenza immunisation	1179	0 (0.0)	6 (0.5)	0 (0.0)	1 (0.1)	13 (1.1)	0 (0.0)	3 (0.3)	5 (0.4)
Immunisation	656	0 (0.0)	5 (0.8)	0 (0.0)	0 (0.0)	6 (0.9)	0 (0.0)	1 (0.2)	9 (1.4)
Vaccination	297	0 (0.0)	3 (1.0)	0 (0.0)	0 (0.0)	2 (0.7)	0 (0.0)	1 (0.3)	1 (0.3)
Mental health	765	5 (0.7)	18 (2.4)	3 (0.4)	1 (0.1)	187 (24.4)	10 (1.3)	23 (3.0)	30 (3.9)
ADHD	95	0 (0.0)	2 (2.1)	0 (0.0)	0 (0.0)	38 (40.0)	0 (0.0)	6 (6.3)	3 (3.2)
Anxiety	103	0 (0.0)	1 (1.0)	0 (0.0)	0 (0.0)	32 (31.1)	0 (0.0)	4 (3.9)	7 (6.8)
Anxiety/depression	74	0 (0.0)	0 (0.0)	3 (4.1)	0 (0.0)	14 (18.9)	3 (4.1)	0 (0.0)	4 (5.4)
ASD	52	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)	14 (26.9)	0 (0.0)	2 (3.8)	1 (1.9)
Phone advice	78	3 (3.8)	0 (0.0)	0 (0.0)	0 (0.0)	9 (11.5)	0 (0.0)	1 (1.3)	3 (3.8)
Check-up	1023	0 (0.0)	13 (1.3)	0 (0.0)	0 (0.0)	28 (2.7)	0 (0.0)	12 (1.2)	5 (0.5)
6-week neonatal check	163	0 (0.0)	2 (1.2)	0 (0.0)	0 (0.0)	3 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)
Check-up	211	0 (0.0)	4 (1.9)	0 (0.0)	0 (0.0)	6 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)
Ear check	130	0 (0.0)	1 (0.8)	0 (0.0)	0 (0.0)	3 (2.3)	0 (0.0)	3 (2.3)	0 (0.0)
Neonatal examination	48	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.2)
Weight check	76	0 (0.0)	2 (2.6)	0 (0.0)	0 (0.0)	3 (3.9)	0 (0.0)	1 (1.3)	0 (0.0)

Unless specified otherwise, data are presented as n (%).

ADHD, attention deficit hyperactivity disorder; ASD, autism spectrum disorder; ED, emergency department.

Aim 3: Factors associated with referrals

Factors associated with GP referrals are shown in Figure 1 (refer also to Appendix 2, available online only). Factors associated with an increased likelihood of GP referral included the practice being private billing (vs bulk billing; risk ratio [RR] 1.72; 95% confidence interval [CI] 1.23–2.39; P=0.001), being a female (vs male) GP (RR 1.30; 95% CI 1.12–1.52; P=0.001), the GP reporting that they were sometimes or frequently (vs rarely) influenced in their decision to refer by the belief that a procedure could only be provided by a paediatrician (RR 1.67 [95% CI 1.18–2.38; P=0.004] and RR 1.54 [95% CI 1.09–2.18; P=0.014, respectively) and the child being older than other children seen by GPs and male.

Factors associated with a reduced likelihood of GP referral include the GP practising for 6–15 (vs <6) years (RR 0.77; 95% CI 0.64–0.92; P=0.005), the GP seeing more than 11 paediatric patients per week (RR 0.72; 95% CI 0.56–0.92; P=0.009) and the GP reporting that they were influenced in their decision to refer by the belief that a paediatrician would better manage the child's condition 'sometimes' (RR 0.56; 95% CI 0.39–0.80; P= 0.002) or 'frequently' (RR 0.60; 95% CI 0.42–0.87; P=0.006).

Aim 4: Cost associated with each referral type, split by reason for initial visit

Estimated costs associated with each reason for visit category and by type of referral made are presented in Table 4. The total cost of referrals was estimated as $1.39 million, equating to a mean cost of $297.96 for each patient referred and a mean cost of $32.03 per patient when considering all patients seen during the study period. The largest estimated referral costs came from children referred to a private specialist ($837,221; 60.4% of total cost). When the take-up of referrals was assumed to decrease from 100% to 80%, the total estimated cost of referrals decreased to $1.08 million, and at 60% uptake it decreased further to $784,142.

Discussion

This is the first study to describe the paediatric case mix seen by Australian GPs, their referral patterns, factors

Table 4. Costs associated with each referral type, split by reason for initial visits

Reason for visit where referral occurred	No. (%) patients referred[A]	Public ED		Public outpatient, other public hospital, private hospital[B]			Private specialist			Public mental health		Allied health		Other[C]		Total cost (% total cost)
		No. referred	Cost[D]	No. referred	Cost new	Cost review[G]	No. referred	Cost new	Cost review[G]	No. referred	Cost[J]	No. referred	Cost[J]	No. referred	Cost	
Medical	2833 (11.1)	241	75,192[D]	440	73,810[E]	70,183[H]	1371	229,985[E]	218,681[H]	20	9303[K]	278	77,637[L]	483	31,009[M]	785,800 (56.7)
Dev/behav	294 (29.2)	5	1560[D]	37	10,855[F]	10,327[I]	139	40,783[F]	38,796[I]	3	1395[K]	87	24,296[L]	23	1477[M]	129,490 (9.3)
Mental health	277 (36.2)	5	1560[D]	22	6455[F]	6140[I]	187	54,866[F]	52,194[I]	10	4652[K]	23	6423[L]	30	1926[M]	134,215 (9.7)
Immunisation	261 (3.8)	1	312[D]	52	8723[E]	8294[H]	136	22,814[E]	21,693[H]	0	0	16	4468[L]	56	3595[M]	69,899 (5.0)
Check-up items	58 (5.7)	0	0	13	2181[E]	2074[H]	28	4697[E]	4466[H]	0	0	12	3351[L]	5	321[M]	17,090 (1.2)
Other	932 (11.7)	51	15,912[D]	159	26,672[E]	25,362[H]	453	75,991[E]	72,255[H]	5	2326[K]	70	19,549[L]	194	12,455[M]	250,522 (18.1)
Combined	4655 (10.8)	303	94,536	723	128,696	122,380	2314	429,136	408,085	38	17,676	486	135,725	791	50,782	1,387,016 (100)
% Total cost			6.8		9.3	8.8		30.9	29.4		1.3		9.8		3.7	100 (100)

Costs are presented in 2023 Australian dollars. Assumes one visit per patient per year, unless indicated otherwise.
[A]Percentages are calculated using the total number of patients presented in Table 3.
[B]Public outpatient, other public hospital, and private hospital were all combined because all children would have been seen by a specialist in these care settings.
[C]Children referred to other services were assumed to have been seen by a nurse.
[D]Public hospital emergency attendance according to Singh et al[15] $312.
[E]Assumes specialist outpatient visit, such as to a paediatrician, Medical Benefits Schedule (MBS) item 110 ($167.75).
[F]Assumes specialist outpatient visit, such as to a paediatrician, MBS item 132 ($293.40).
[G]Based on Longitudinal Study of Australian Children linked Medicare data; children, on average, receive one initial specialist visit plus 1.9 review visits within a one-year period (calculation by authors).
[H]Assumes specialist outpatient visit, such as to a paediatrician, MBS item 116 ($83.95).
[I]Assumes specialist outpatient visit, such as to a paediatrician, MBS item 133 ($146.90).
[J]Based on mean number psychologist visits of 2.9 per child (Mulraney et al[7]); the number of allied health visits was assumed to be same as mental health visits.
[K]Assumes psychologist visit, MBS item 80010.
[L]Assumes allied health visit, such as to a speech pathologist, occupational therapist, audiologist, optometrist, orthoptist or physiotherapist; MBS items 82020, 82025 and 82035.
[M]Assumes practice nurse visit, MBS item 82215.
Dev/behav, developmental–behavioural; ED, emergency department.

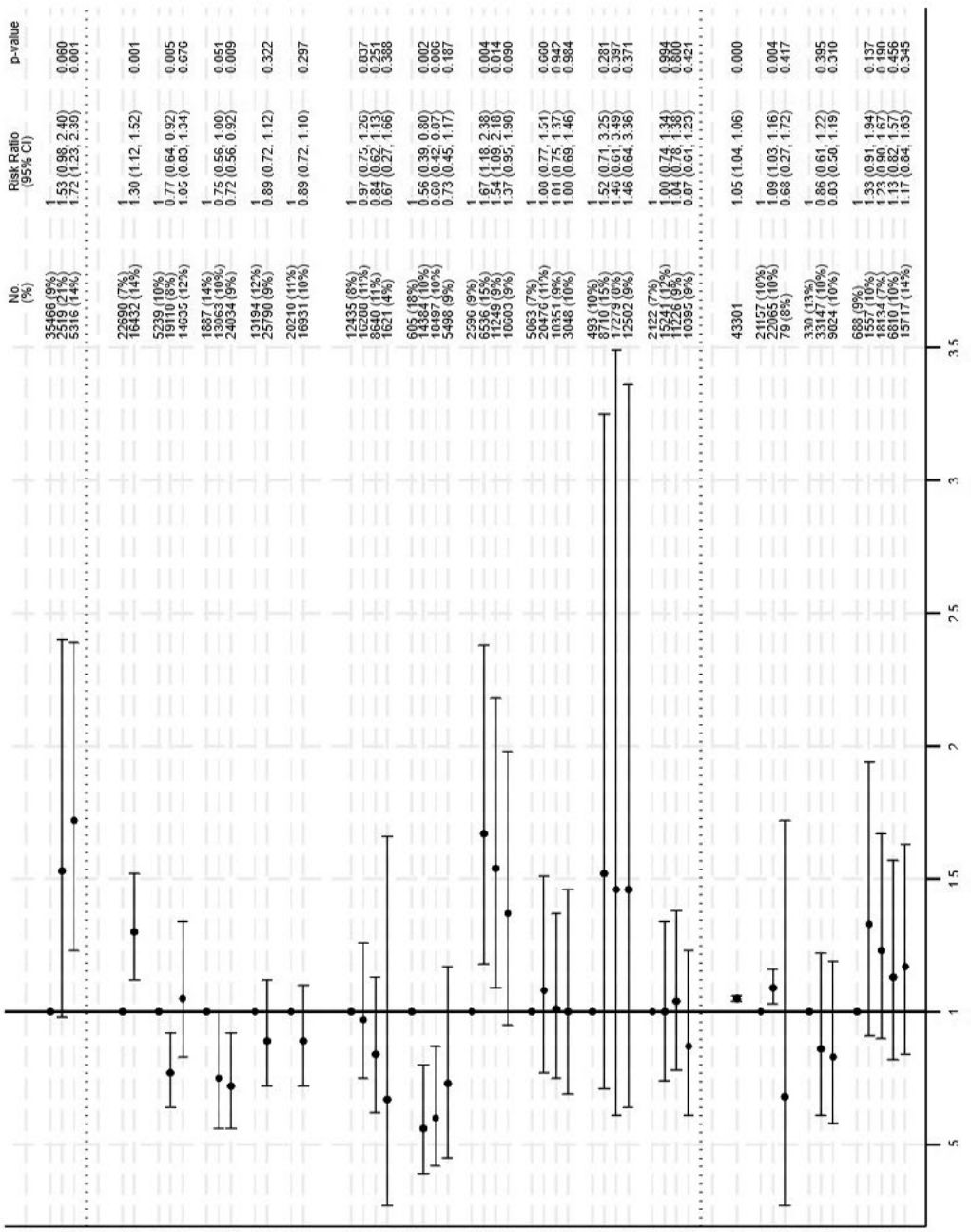

Figure 1. Mean risk ratios (RRs) and 95% confidence intervals (CIs) for clinic-, general practitioner (GP)- and child-level factors associated with onward referral at clinic visits.
IRSAD, Index of Relative Socio-economic Advantage and Disadvantage; Paed, paediatrician; SEIFA, Socio-Economic Indexes for Areas.

associated with referrals and costs. Across 49,932 consultations, GPs saw children most commonly for medical conditions, immunisations and check-ups. Overall, GPs referred 10% of patients. The factor most strongly associated with referral was practice private billing. The total cost of referrals was estimated as $1.39 million (ie an average of $297.96 per patient referred). The largest category of referral cost was 'private specialists', predominantly paediatricians.

Mental health or developmental–behavioural problems were commonly referred and usually to private specialists. Australian GP registrars have reported a relative lack of confidence in managing these sorts of problems compared with medical problems in children, but it is unknown whether the same is true for practising GPs.[10] The fact that private-billing practices were more likely than bulk- or mixed-billing practices to refer children is potentially concerning. It could be due to selection bias, with parents attending private-billing practices more likely to request referrals to a private paediatrician, or due to inequity of referrals. Children from lower socioeconomic areas are more likely to have mental health and developmental–behavioural problems than those from wealthier areas.[11] However, these children, being more likely to attend bulk billing practices, received fewer referrals for specialist care. Although female GPs spend longer in consultations than male GPs,[12] it is unclear why being a female GP was associated with more referrals, even after controlling for GP case mix by gender. This requires further investigation.

GPs who had been practising for 6–15 years were the least likely to refer. This could reflect a 'sweet spot' whereby GPs with more experience than those working for less than six years have greater confidence to manage mental health and developmental–behavioural problems, whereas those practising for longer might have missed out on training in the 'new morbidities' of developmental–behavioural and mental health problems.[13]

This study has several strengths. We used objective measures of outcomes from general practice EMRs and included rich data from practices with a range of practice billing types, GP experience and patient socioeconomic status. The study also has some limitations. We sampled metropolitan practices only, so future research should examine rural practices. Practices self-selected, so might represent a bias towards paediatric care, but participating practices were similar in socioeconomic status to other practices in their primary health network. We used EMR data entered by GPs, and thus some data might be incomplete or incorrectly entered. GPs sometimes recorded several reasons for a visit, but for the purposes of this analysis, we only coded the first reason entered. However, we believe that basing our analyses on the first reason for the visit recorded in the EMR allows for an understanding of the broad patterns of referrals and associated factors and costs, given that anecdotally (we could find no published evidence) clinicians tend to enter the main diagnosis first. Finally, we collected data during the COVID-19 pandemic and associated lockdowns when paediatric ED presentations for infections and injuries declined and fewer children visited GPs.[14,15] This will have affected referral patterns.

Conclusion

In conclusion, Australian GPs see children for a range of conditions. They are more likely to refer mental health and developmental–behavioural than other conditions. Models of care that increase the equity of referrals for such conditions (eg integrated primary and specialist care,[5] school-based healthcare[16,17]) are crucial if we are to provide specialist care to all Australian children who need it. Paediatric referrals incur a significant cost, which presents an important opportunity for strengthening primary care to be more equitable and efficient.

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