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ORIGINAL ARTICLE

Trends in paediatric practice in Australia: 2008 and 2013 national audits from the Australian Paediatric Research Network

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Aim: In adult medicine, rates of investigation and prescribing appear to be increasing. Such information is lacking for paediatrics. We audited Australian paediatricians' practices in 2013 to determine changes since 2008 in: (i) conditions seen; (ii) consultation duration; (iii) imaging and pathology ordered; and (iv) prescribing.

Methods: This is a patient-level prospective audit of paediatricians' secondary care practice. Between November and December 2013, members of the Australian Paediatric Research Network were invited to complete standardised forms for 100 consecutive patients or all patients seen over 2 weeks, whichever was completed first. Main measures: diagnoses, consultation duration, pathology and/or imaging investigations ordered, rate of medication prescription. Analyses: hierarchical linear modelling clustered at the paediatrician level.

Results: One hundred and eighty paediatricians (48% of those eligible) contributed 7102 consultations. The proportion of developmental/behavioural conditions rose from 48% (SD 31%) to 60% (SD 30%) in new and 54% (SD 28%) to 66% (SD 28%) in review consultations in 2013 compared with 2008. More paediatricians reported diagnoses of autism spectrum disorder (39–56%, $P = 0.002$), attention-deficit/hyperactivity disorder (47–55%, $P = 0.05$) and intellectual disability (18–36%, $P = 0.001$) in first consultations. Mean consultation duration and pathology/imaging ordering rates were stable. Prescribing rates increased from 39 to 45% of consultations for the top 10 new diagnoses and from 57 to 68% of consultations for the top 10 review diagnoses.

Conclusions: Paediatricians are seeing more children with developmental–behavioural conditions, prescribing more and demonstrating wide variation in their practice. The latter suggests both over- and under-treatment.

Key words: audit; children; developmental–behavioural; paediatrician.

What is already known on this topic

1 Rates of investigation and prescribing in adult medicine are known to be increasing; however, such information is lacking for paediatrics.
2 Analysis of information on diagnoses, investigations and treatments – available in a single whole-of-practice framework – is needed in order to describe trends in paediatric medicine.

What this paper adds

1 In a national, prospective audit of diagnoses, investigations and treatments, Australian paediatricians report diagnosing more developmental and behavioural conditions and prescribing more medication over a 5-year period.
2 Marked inter-paediatrician variation suggests both over- and under-treatment.

In adult medicine, delivery of many health-care practices has increased in recent years. Some of these are clearly beneficial, reflecting either treatment advances such as combination therapy for HIV[1] or the use of genomic testing to direct more specific cancer therapy.[2] However, other widely implemented activities are costly, of uncertain benefit and may even be harmful, including screening activities (e.g. for prostate cancer), imaging (e.g. for back pain) and prescribing (e.g. for mild hypertension).

Like adults, today's children live in a world where the epidemiology of health and disease continues to evolve and where the choices regarding care that could be provided are greater than ever before. On the one hand, the incidence of some conditions has clearly risen in recent years (e.g. diabetes, food allergy), and for others, new evidence from rigorous trials has clearly demonstrated benefits from medication (e.g. stimulants for core symptoms of attention-deficit/hyperactivity disorder,[3] selective serotonin reuptake inhibitors for moderate/severe anxiety).[4] In these instances, an increase in prescribing might be seen as appropriate. On the other hand, children's health care is as open as that of adults to over-diagnosis (when a true abnormality is

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discovered but detection of that abnormality does not benefit the patient) and over-treatment/overuse (when excess medication or procedures are provided to patients for both correct and incorrect diagnoses).[5] Many problems, such as learning problems, autism spectrum disorders and mental health disorders, may also be open to 'diagnosis creep', where less well-defined difficulties that might in earlier decades have been considered normal are increasingly coming to medical attention.

Before issues of 'too much medicine' or 'too little medicine' can be addressed in paediatric practice, it is necessary to know 'how much medicine' is occurring, yet such evidence is scant. For example, while Australian national data are collected on medications dispensed and investigations ordered by doctors, diagnostic data are not linked to these practices. Therefore, it is impossible to say whether a particular practice represents optimal care. As a starting point, it is vital to document the evolution of current practice, specifically secular trends in diagnosis, investigation and management. One way of doing this is via national practice audits of care. Ideally, these would bring together all of the necessary information – diagnoses, treatments and investigations – into a single whole-of-practice framework.

In Australia, general paediatricians provide care to children and adolescents, predominantly in secondary care settings, including private practices, hospital outpatient clinics and community health centres. To be seen by a general paediatrician, children must be referred by a general practitioner, which allows families to receive a Medicare (financial) rebate for the consultation.[6] In 2008, we conducted the first national audit of general and community paediatric practice. We found that developmental and behavioural conditions accounted for the bulk of the general paediatric casemix.[7] We repeated this audit in 2013. This paper reports diagnoses and management practices and compares them with those reported in 2008. We hypothesised that, compared with 2008, paediatricians in 2013 would report (i) an increase in the proportion of consultations for developmental and behavioural conditions; (ii) a decrease in time spent per consultation; (iii) an increase in imaging and pathology testing and (iv) an increase in the prescription of medications.

Methods

This was a prospective clinical audit of general paediatricians' outpatient practice in public hospital outpatient clinics, community health centres and private rooms.

All members of the Australian Paediatric Research Network (APRN), a national, practice-based, secondary care research network, were invited via email to take part in October 2013. Audit booklets were mailed to eligible and interested paediatricians. Paediatricians were asked to complete a data form for each patient seen over a 2-week period, from 18 November to 2 December 2013, or for 100 consecutive patients, whichever came first. Paediatricians mailed completed booklets back to the research team.

Measures

To report change over time, the data collection form (Fig. 1) replicated the 2008 form.[7] This was modelled on the form used by Bettering the Evaluation and Care of Health (BEACH). BEACH has, for many years, conducted an annual audit of a national random sample of Australian general practitioners.[8] The form included the consultation date, start and end times; practice setting; family and paediatrician practice postcode, language spoken at home, the child's height and weight; diagnoses made; investigations ordered; medications prescribed (including over-the-counter medications such as vitamins); vaccines administered; referrals made; and Medicare consultation items numbers billed, encompassing simple (i.e. one condition) and complex (i.e. two or more conditions) new and review consultation item numbers.

A list of the 60 most common diagnostic codes, replicating the 2008 audit, was provided on the back of each consultation form. Paediatricians could either write the code corresponding to a diagnosis or write the diagnosis if it was not on the list. Each booklet comprised 100 data collection forms and instructions on how to complete the booklet.

All completed booklets were hand cleaned and then scanned and verified using Cardiff Teleform 10.2 (Cardiff, Brookline, Massachusetts, USA) software by the research team. Members of the APRN steering committee (HH, MW, DE, MHD and GR) assigned codes and cross-checked the 56 diagnoses recorded in addition to the 60 most common diagnoses (i.e. total of 116 diagnoses coded). Paediatrician practice postcodes were used to calculate the census-derived Socio-Economic Indexes for Areas (SEIFA) index for relative social disadvantage (national mean of 1000, standard deviation of 100).[9] Lower scores reflect greater disadvantage.

Ethics approval was granted by The Royal Children's Hospital Human Research Ethics Committee (HREC #33197).

Statistical analyses

To determine nation-wide generalisability, demographic and practice characteristics of APRN member responders were compared with characteristics of APRN member non-responders and Australian general paediatricians based on the 2013 Australian Health Practitioner Regulation Agency workforce survey (completed by around 96% of medical specialists). Characteristics of children seen were calculated as means and standard deviations (e.g. for age) and proportions (e.g. for gender, number of comorbidities). Consultations were categorised as 'new' or 'review' based on the Medicare billing coding.

To compare data from 2008 and 2013, we used multi-level models (random effect regression),[10] which allowed for the analysis of all paediatricians, regardless of participation in both 2008 and 2013 waves. We clustered consultations at the paediatrician level (Level 2), allowing for the repeated measurement of consultations (Level 1) within paediatricians as well as over time. Medication, consult and paediatrician rate within diagnosis models were clustered at the paediatrician level only. We examined whether there was evidence of change over time in any of our outcomes of interest (types of consultations, time spent per consultation, use of imaging and pathology investigations, prescription of medication). All analyses were performed using Stata version 13.1 (StataCorp, College Station, Texas, USA).

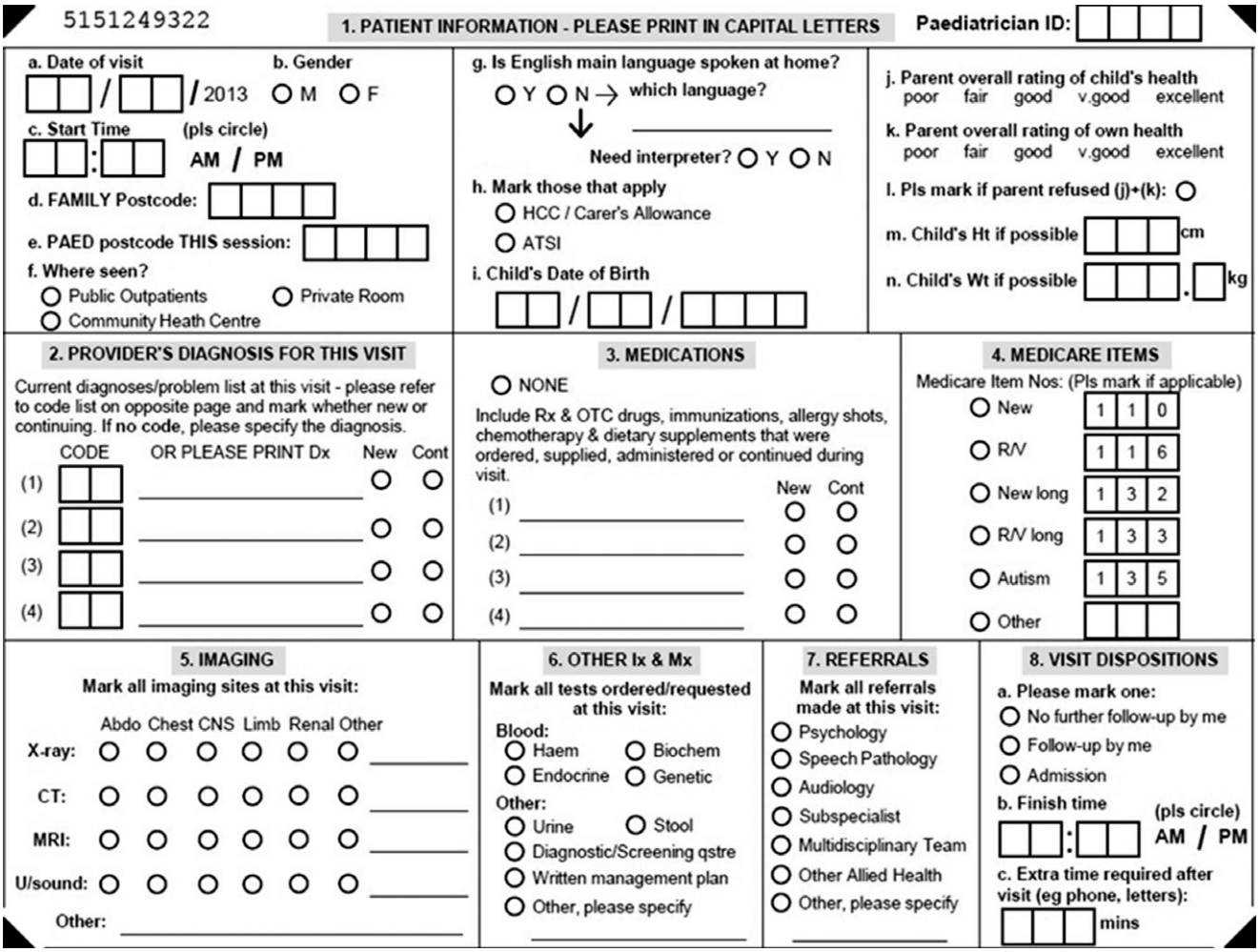

Fig. 1 Data collection form.

Results

Of the 451 APRN members, 75 (17%) were ineligible (e.g. on leave, illness, uncontactable, retired), and 180 of the remaining 376 (48%) participated. Paediatricians working in the state of Victoria were over-represented, while those working in New South Wales, South Australia, Tasmania and the Northern Territory were under-represented relative to the national distribution of paediatricians.[11] Compared with general paediatricians across Australia, responders were more likely to be female, younger and working part time (Table 1).

Paediatricians collected data on 7102 consultations over the 2-week period. Children from a broad socio-economic range were seen at practices (SEIFA mean 1000.4, SD 69.6). Most children seen were male (57%), with a mean age of 7.6 years (SD 5.6 years). The proportion of children diagnosed with one, two and three or more conditions was 35.1, 32.7 and 31.8%, respectively (Table 2).

Similar to 2008, the majority of 2013 consultations were for developmental and behavioural problems, but the proportion of consultations including such conditions increased across both new and review consultations from 2008 to 2013 (see Table 3). Overall, developmental and behavioural problems rose from 48% (SD 31%) to 60% (SD 30%) of paediatricians' new consultations and from 54% (SD 28%) to 66% (SD 28%) of review consultations (both $P < 0.001$). In 2013, autism spectrum disorders were the most common new diagnosis (15% in 2013 vs. 5% in 2008), and more paediatricians reported making this diagnosis in 2013 than in 2008 (56 vs. 39%). A similar pattern was seen in review diagnoses. Attention-deficit/hyperactivity disorder not only remained the most common condition managed by paediatricians overall but increased as a diagnosis in both new and review consultations (from 10 to 14% and from 22 to 28%, respectively). Anxiety, sleep problems and intellectual disability (IQ < 70) were all more likely to be diagnosed in 2013 compared with 2008. Consultation length changed little between 2008 and 2013 for either new or review consultations.

In both 2008 and 2013, imaging was ordered in fewer than 6% of consultations, with no change between the two audits. Similarly, the rate of pathology orders was unchanged (new, 14.8% in 2008 and 15% in 2013; review, 6% in both 2008 and 2013).

Table 1 Comparison of Australian general paediatricians and responding and non-responding Australian Paediatric Research Network (APRN) members

Characteristic	*n* (%)		
	All paediatricians (*n* = 1442)	APRN responders (*n* = 180)	APRN non-responders (*n* = 196)
Male	701 (48.6)	82 (45.6)	112 (57.1)
Age (years)			
<44	440 (30.5)	71 (39.4)	87 (44.4)
45–54	463 (32.1)	60 (33.3)	65 (33.2)
55–64	342 (23.7)	31 (17.2)	37 (18.9)
65+	146 (10.1)	13 (7.2)	2 (1.0)
State			
Australian Capital Territory	23 (1.6)	8 (4.4)	5 (2.6)
New South Wales	486 (33.7)	49 (27.2)	63 (32.1)
Northern Territory	NP	1 (0.6)	7 (3.6)
Queensland	270 (18.7)	27 (15.0)	32 (16.3)
South Australia	112 (7.8)	4 (2.2)	11 (5.6)
Tasmania	NP	3 (1.7)	3 (1.5)
Victoria	356 (24.7)	75 (41.7)	50 (25.5)
Western Australia	133 (9.2)	12 (6.7)	25 (12.8)
Working hours†			
Part time	373 (25.9)	111 (61.7)	69 (35.2)
Full time	837 (58.0)	50 (27.8)	16 (8.2)
Practice location			
Metropolitan	1182 (82.0)	128 (71.1)	145 (74.0)
Regional/rural	216 (15.0)	49 (27.2)	38 (19.4)

†Missing data due to poor response for item. NP, not provided.

Table 2 Patient characteristics in 2008 and 2013

Characteristic	2008 (*n* = 8345)	2013 (*n* = 7102)	*P-value*
Male, *n* (%)	4796 (57.5)	4019 (56.6)	0.77
Age (years), mean (SD)	6.6 (5.5)	7.6 (5.6)	<0.001
English first language, *n* (%)	7333 (87.9)	6705 (94.4)	<0.001
SEIFA, mean (SD)	996.6 (75.8)	1004.3 (69.6)	<0.001
Diagnosis			<0.001
1	3841 (46.0)	2490 (35.1)	
2	2578 (30.9)	2325 (32.7)	
3 or more	1906 (22.8)	2255 (31.8)	

SEIFA, Socio-Economic Indexes for Areas.

The prescribing of medications, including over-the-counter products, increased over this period of time for almost all common conditions, falling slightly in only one of the top 10 new conditions (language delay) and one of the top 10 review conditions (well baby check). Increases in prescribing rates were particularly marked for autism (28% of new diagnoses in 2008, 42% in 2013, $P = 0.04$), anxiety (59–74% for review diagnoses, $P = 0.008$), sleep disturbance (29–52% for new diagnoses, $P = 0.003$), behaviour (53–65% for review diagnoses, $P = 0.04$), constipation (75–89% for review diagnoses, $P = 0.006$) and asthma (75–86% for new diagnoses, $P = 0.007$) (Table 3). There were large SD in mean rates of prescribing across all conditions, indicating wide inter-paediatrician variation. We found a similar pattern of changes when we restricted our sample to the 113 paediatricians who completed the audit at both time points (Table 4).

Discussion

In the 5-year period 2008–2013, consultations for developmental and behavioural problems rose to become an even higher proportion of Australian general/community paediatric practice. Unlike the stability seen in mean consultation duration and rates of imaging and pathology investigations, prescribing rates rose markedly across virtually every condition and for both new and review consultations.

Table 3 2013 top 10 ranked new and review consultations, comparing 2008 and 2013 outcomes

		% consults including diagnosis		% paediatricians seeing diagnosis		Duration, mean (SD)†		% medication, mean (SD)†	
		08	13	08	13	08	13	08	13
New									
1	Autism spectrum disorder	**5**	**15**	**39**	**56**	51.3 (19.2)	48.0 (16.8)	**28.5 (39.2)**	**41.5 (39.2)**
2	Attention-deficit/hyperactivity disorder	**10**	**14**	**47**	**55**	48.7 (21.7)	46.0 (21.5)	57.1 (38.4)	62.8 (38.7)
3	Sleep disturbance	**4**	**8**	33	41	43.6 (15.7)	43.5 (15.3)	**28.7 (42.7)**	**51.9 (42.8)**
4	Learning difficulty/disability	8	7	44	48	56.4 (25.3)	46.9 (25.1)	33.6 (41.6)	36.6 (41.6)
5	Behaviour	6	7	43	47	50.9 (17.1)	48.1 (16.6)	23.6 (38.4)	32.6 (38.4)
6	Language delay	6	6	44	41	57.1 (27.4)	46.6 (27.0)	26.5 (37.6)	22.2 (37.6)
7	Anxiety	5	6	36	44	51.0 (28.3)	51.8 (27.4)	27.5 (38.6)	38.0 (38.7)
8	Asthma	6	6	39	36	46.6 (18.4)	42.2 (17.2)	**75.2 (32.0)**	**85.6 (31.7)**
9	Allergy-other food‡	6	6	28	24	54.4 (22.0)	45.5 (20.0)	63.7 (41.7)	70.4 (41.7)
10	Intellectual disability	**2**	**5**	**18**	**36**	50.5 (24.3)	46.1 (26.9)	45.4 (44.0)	55.0 (44.3)
	Total (top 10 new)	**41**	**53**	85	92	49.6 (17.9)	45.9 (17.6)	38.9 (32.1)	44.8 (32.2)
Review									
1	Attention-deficit/hyperactivity disorder	**22**	**28**	68	74	25.5 (12.1)	26.6 (11.9)	87.4 (21.0)	88.2 (21.0)
2	Autism spectrum disorder	**9**	**14**	**61**	**72**	**27.0 (9.6)**	**28.5 (9.3)**	**50.9 (35.9)**	**61.7 (36.0)**
3	Learning difficulty/disability	8	10	**49**	**58**	29.6 (14.6)	29.5 (14.9)	56.2 (38.5)	66.3 (38.5)
4	Baby check (premature/full-term)	**12**	**9**	**45**	**36**	**22.6 (10.7)**	**21.6 (9.6)**	27.1 (32.1)	20.5 (30.8)
5	Anxiety	**4**	**8**	**43**	**56**	30.7 (20.7)	31.2 (20.8)	**58.5 (37.7)**	**73.6 (37.7)**
6	Sleep disturbance	**3**	**7**	**33**	**53**	**26.9 (14.9)**	**32.3 (14.0)**	**50.4 (39.6)**	**71.2 (39.7)**
7	Asthma	7	6	53	55	24.3 (9.5)	26.7 (9.1)	79.9 (31.2)	81.4 (31.0)
8	Behaviour	**5**	**6**	55	56	28.7 (13.1)	29.7 (12.3)	**52.6 (41.3)**	**64.7 (41.3)**
9	Intellectual disability	**4**	**6**	46	55	29.6 (13.8)	30.1 (13.9)	66.5 (37.7)	67.7 (37.9)
10	Constipation	4	5	**40**	**53**	25.1 (11.2)	25.7 (11.8)	**75.3 (30.7)**	**88.6 (30.8)**
	Total (top 10 review)	**59**	**65**	93	94	25.5 (11.0)	27.3 (10.6)	**56.9 (26.0)**	**67.8 (25.9)**

†Estimated mean and SD from multi-level models. ‡Allergy to food other than cows milk protein. Bolded tests = significant ($P < 0.05$).

Strengths and limitations

This study has a number of strengths. It is the only Australian audit of paediatric practice in non-acute settings and used an established data collection method.[8] It collected rich data over two time points, with the same 113 (42%) APRN paediatricians participating both times. We could find no comparable international audits of paediatric speciality care.

Among the study's limitations are that only around half of the eligible APRN members took part, and those that did were more likely to be female, younger and working part time than Australian general paediatricians overall. As such, our results may not generalise to male or older paediatricians or those working full time. However, our 2008 audit showed no evidence of developmental–behavioural caseload differences by paediatrician gender.[7] Although collected prospectively and in real time, our audit relied on reported and not actual practice. Use of electronic records may be considered more valid but still relies on the accurate input of data and is not a viable option given that only 50% of Australian paediatricians use electronic medical records.[12] While we reported medications prescribed by the child's first listed diagnosis, many children had more than one diagnosis, and so, the medication may have been for a comorbid diagnosis. Paediatricians were more likely to record seeing a child with three or more diagnoses in 2013 (32%) compared with 2008 (23%), and this may explain some of the increase in prescribing.

Interpretation of findings

There are many possible reasons why a much higher proportion of paediatric outpatient practice now involves developmental and behavioural problems; some or all may coexist, and none can be confirmed by this or other published studies. 'Too much medicine' is one possibility and could be supported by the increasing proportion of children being diagnosed with less categorical conditions such as anxiety and sleep problems from 2008 to 2013. However, this rise could equally represent (i) a greater availability of private paediatric services; (ii) increased parental awareness and hence presentation to GPs (the gateway to paediatric referral); (iii) the rising proportion of longer general practice consultations now given over to diseases of ageing, thus squeezing out children[13] and/or (iv) changes in funding and remunerative structures. For example, the recent provision of Australian government funding ($AUS 12,000 per child) for early intervention services for certain conditions has almost certainly prompted families to attend paediatricians for a diagnosis; however, this funding does not apply to other conditions where diagnoses as a proportion of consultations

Table 4 CAPS 2013 top 10 ranked new and review consultations by the 113 paediatricians who completed the 2008 and 2013 audits

		% consults including diagnosis		% paediatricians seeing diagnosis		Duration, mean (SD)†		% medication, mean (SD)†	
		08	13	08	13	08	13	08	13
New									
1	Autism spectrum disorder	**5**	**15**	**40**	**61**	51.8 (20.6)	49.4 (17.8)	29.7 (39.0)	41.3 (39.0)
2	Attention-deficit/hyperactivity disorder	**11**	**15**	**51**	**62**	48.9 (15.8)	47.6 (15.4)	61.8 (38.1)	61.0 (38.6)
3	Sleep disturbance	**3**	**6**	32	42	48.7 (14.6)	44.4 (13.9)	**26.3 (42.5)**	**53.2 (42.5)**
4	Learning difficulty/disability	8	8	43	55	**55.5 (17.6)**	**47.8 (18.4)**	33.1 (41.7)	35.3 (41.9)
5	Behaviour	7	7	51	51	49.6 (17.5)	50.6 (16.2)	30.1 (39.7)	32.5 (39.7)
6	Language delay	6	7	43	47	50.5 (17.7)	46.3 (17.7)	29.4 (37.9)	21.8 (37.9)
7	Anxiety	5	6	41	48	50.3 (27.0)	52.5 (26.0)	27.2 (39.6)	35.3 (39.8)
8	Asthma	6	6	40	38	45.2 (19.3)	44.5 (18.6)	**69.6 (34.9)**	**84.5 (34.6)**
9	Allergy – other food‡	6	6	29	23	**57.2 (22.6)**	**45.7 (20.8)**	68.5 (41.9)	57.2 (41.9)
10	Intellectual disability	**3**	**5**	**21**	**38**	44.9 (19.3)	48.3 (21.2)	44.6 (43.5)	51.6 (43.9)
	Total (top 10 new)	**41**	**53**	89	93	49.3 (13.7)	46.9 (13.2)	39.2 (32.6)	43.1 (32.8)
Review									
1	Attention-deficit/hyperactivity disorder	**21**	**30**	65	75	24.8 (10.4)	26.9 (10.6)	84.4 (21.4)	89.2 (21.4)
2	Autism spectrum disorder	**8**	**14**	**63**	**74**	**26.9 (10.1)**	**29.1 (9.9)**	52.4 (36.0)	61.9 (36.2)
3	Learning difficulty/disability	8	11	**50**	**62**	27.8 (9.8)	28.4 (10.3)	56.9 (38.8)	62.7 (39.0)
4	Baby check (premature/full-term)	12	10	48	39	**22.0 (7.1)**	**20.0 (6.8)**	27.0 (31.9)	19.7 (31.0)
5	Anxiety	**4**	**7**	47	54	28.8 (25.1)	31.6 (26.1)	**56.3 (38.1)**	**75.7 (38.1)**
6	Sleep disturbance	**3**	**6**	**36**	**51**	29.0 (12.9)	30.8 (12.1)	**49.6 (39.4)**	**75.4 (39.4)**
7	Asthma	6	7	55	57	22.9 (10.3)	27.3 (9.7)	79.0 (32.3)	82.1 (32.7)
8	Behaviour	**4**	**7**	51	59	29.0 (11.5)	30.0 (11.1)	**47.2 (41.6)**	**63.1 (41.6)**
9	Intellectual disability	**4**	**6**	48	57	28.8 (12.3)	29.8 (12.4)	68.3 (34.2)	76.1 (34.4)
10	Constipation	5	5	43	54	25.6 (10.9)	25.6 (11.8)	78.9 (29.7)	87.8 (29.7)
	Total (top 10 review)	**58**	**68**	94	94	24.9 (9.5)	26.9 (9.4)	**56.8 (25.7)**	**68.4 (25.8)**

†Estimated mean and SD from multi-level models. ‡Allergy to food other than cows milk protein. Bolded tests = significant ($P < 0.05$). CAPS, Children Attending Paediatricians Study.

have also increased. Whatever the reason, these increases could be 'good'; for example, recent data from a Swedish population-based study indicate that autism diagnosis is now approaching the population prevalence of the autism phenotype.[14] On the other hand, these increases could be 'bad' if they represent the over-diagnosis of children with milder difficulties who are less likely to benefit and may even experience resulting harm.

Similarly, the marked rise in prescribing could represent over-treatment and/or better implementation of existing treatments and availability of new ones. For example, melatonin has been shown in a controlled trial to improve sleep onset in children with neuro-developmental disabilities,[15] and its availability through compounding pharmacies has led to the rapid uptake by Australian paediatricians.[16] On the other hand, there is good evidence that brief (i.e. two to three sessions) non-pharmacological interventions are effective in reducing sleep problems, including sleep onset delay in children without neuro-developmental disorders[17,18] as well as those with attention-deficit disorder.[19] The potential factors underlying the rising use of medication for anxiety are less clear. While non-pharmacological interventions such as cognitive behavioural therapy (CBT) are effective in treating anxiety,[20] their intensity (typically requiring 10 sessions or more[20]), cost and lack of availability may make medication a practical alternative. Furthermore, children may have already received non-pharmacological therapy at the time of their first consultation with the paediatrician. For more severe anxiety, the synergistic use of CBT and medications such as sertraline is more effective than either therapy alone, and therefore, use of medication may reflect appropriate management.[21]

Whatever the appropriateness of medication for different conditions, the marked inter-paediatrician variation evidenced by the large SD suggests that both over- and under-treatment are common. Large variation has also been reported in hospitalists' management of common child health conditions in the United States, even for therapies with a proven evidence base.[22] Similarly, a review of practice variation for 16 common child conditions found that unwarranted variation in care, largely reflecting over-treatment, was widespread across conditions and health sectors.[23]

Paediatricians are seeing more children with developmental–behavioural conditions, prescribing more and demonstrating wide variation in their practice. Whether paediatricians are over-diagnosing and over-treating conditions requires further research to establish whether making these diagnoses leads to better outcomes for children and families.[5] Ideally, this would involve prospective, routine data collection of paediatricians' diagnosis, investigations and treatment at a population level, with a marker of the severity of conditions. Further research into systems

(e.g. access to services), patient (e.g. costs and family preferences) and paediatrician level (e.g. knowledge and training) factors driving paediatricians' practices is also needed.

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