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Adherence to Clinical Guidelines for Dose Finding and Monitoring Methylphenidate Use: A Medical Record Audit in Child and Adolescent Mental Health Care and Pediatric Settings

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Abstract

Background: Guideline adherence is important to ensure optimal and safe use of methylphenidate for children and adolescents with attention-deficit/hyperactivity disorder (ADHD). We investigated adherence to Dutch guidelines regarding dosing and monitoring of methylphenidate in child and adolescent mental health care and pediatric treatment settings.
Methods: Five hundred six medical records of children and adolescents were investigated in 2015 and 2016. We assessed adherence to the following guideline recommendations: (1) at least four visits during the dose-finding phase; (2) monitoring thereafter at least every 6 months; (3) measuring height and weight at least annually; and (4) the use of validated questionnaires to assess treatment response. Pearson's chi-squared test statistics were used to examine differences between settings.
Results: Only a small portion of patients had at least four visits during the dose-finding phase (5.1% in the first 4 weeks to 12.4% in the first 6 weeks). Also, less than half of the patients (48.4%) were seen at least every 6 months. Height was recorded at least annually in 42.0% of patients, weight in 44.9%, and both recorded in a growth chart in 19.5%. Questionnaires to assess treatment response were only used in 2.3% of all visits. When comparing both settings, more patients in the pediatric settings were seen every 6 months, although height and weight were recorded more often in the mental health care setting.
Conclusion: Overall, guideline adherence was low. Training of clinicians and adding guideline recommendations to electronic medical records templates may improve adherence. Additionally, we should aim to close the gap between guidelines and clinical practice by looking critically at the feasibility of guidelines.

Keywords: ADHD, audit, children, guideline adherence, methylphenidate

Introduction

To ensure optimal and safe care for children and adolescents with attention-deficit/hyperactivity disorder (ADHD), it is important that treatment with methylphenidate is being prescribed and monitored in accordance with clinical guideline recommendations. Recommended dose-finding strategies require regular assessments of effectiveness and safety of methylphenidate during the initial treatment period of 4 to 6 weeks (dose-finding phase). According to the Dutch Multidisciplinary Guideline for the

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assessment and treatment of ADHD in children and youth (National Steering Committee Guideline Development in Mental Health Care, 2005), the mental health care guideline for ADHD (Akwa, 2019), and the National Institute for Health and Care Excellence (NICE) Guidelines on diagnosis and management of ADHD (National Institute for Health and Care Excellence, 2018; National Institute for Health and Care Excellence, 2009), it is recommended to start with a low dosage (e.g., two or three times 5 mg/day) and then titrate upward, preferably weekly, until the optimal dosage has been found or the maximum daily dosage (60 mg/day; National Health Care Institute, n.d.) has been reached.

Thereafter, monitoring of treatment effectiveness and side effects should take place at least once every 6 months. Height and weight should be monitored at least annually to keep track of potential growth suppression (National Steering Committee Guideline Development in Mental Health Care, 2005). Moreover, it is recommended to use validated questionnaires to assess the effectiveness during both the dose-finding phase and follow-up monitoring (National Institute for Health and Care Excellence, 2009; National Steering Committee Guideline Development in Mental Health Care, 2005).

Through investigation of medical records, we assessed how well these guideline recommendations were met in clinical practice in child and adolescent mental health care and pediatric treatment settings, where treatment with methylphenidate is mostly initiated in the Netherlands (Hodgkins et al., 2011). In mental health care settings, psychiatrists are responsible for the initiation and follow-up monitoring of medication as long as the patients are still under their care. However, in many cases, a physician or physician assistant supervised by a psychiatrist does the actual initiation and/or follow-ups in practice. In pediatric settings, initiation and monitoring of ADHD medication is done by a pediatrician or a physician or nurse practitioner under supervision of a pediatrician. Previous audits on the diagnosis and treatment of ADHD found mixed results. A South African study found low NICE guideline adherence with regard to growth chart plotting, but better adherence regarding side effect monitoring and treatment response monitoring on rating scales (Vrba et al., 2016). An Australian study found a mean adherence of 83.6% to 34 indicators identified through local and international guidelines for treatment of ADHD (Braithwaite et al., 2018).

Studies imply differences between mental health care and pediatric settings, as in the mental health care setting, more children with comorbidities are being treated (Harpaz-Rotem and Rosenheck, 2006), and in a higher proportion of visits, psychotropic medication is being prescribed (Thomas et al., 2006). However, differences in guideline adherence between these settings are unknown. Therefore, we also compared guideline adherence of both settings as an additional aim.

Methods

Sample and procedure

Between March 2015 and July 2016, we investigated 506 medical records of children, adolescents, and young adults (age range 4–24 years of age at first prescription of ADHD medication) from two large organizations for child and adolescent mental health care and nine pediatric outpatient clinics spread across the Netherlands in a 2:1 ratio between mental health care and pediatric settings. Every center provided a list of patients who had started methylphenidate treatment in 2008 or 2012 and we investigated consecutive medical records until we had reached our predetermined target for each center (targets differed per center and between mental health care and pediatric settings, depending on the size of the center; Matthijssen et al., 2022). These years were chosen because of a twofold increase in the number of ADHD medication prescriptions in the Netherlands, from 1.8% of children and adolescents in 2008 to 3.9% in 2012. We defined both face-to-face visits and contacts with the clinician (i.e., nurse practitioner, physician, pediatrician, or psychiatrist) by phone as ''visits.''

The medical files were reviewed by two trained research assistants using a checklist covering all guideline recommendations. Regular meetings ensured scoring integrity and consensus. As per Dutch law, no ethics approval or informed consent was needed because our study solely investigated medical records.

We assessed guideline adherence to the following recommendations from the Dutch multidisciplinary guidelines for the assessment and treatment of ADHD in children and adolescents from 2005 (National Steering Committee Guideline Development in Mental Health Care, 2005) regarding the titration of methylphenidate and the monitoring of treatment with methylphenidate: (1) dosage should be uptitrated and evaluated weekly during the dose-finding phase; (2) monitoring of effectiveness thereafter should be scheduled at least every 6 months; (3) height and weight should be measured and recorded in a growth chart at least annually; and (4) validated questionnaires should be used to assess treatment response.

Data analyses

Statistical analyses were performed with R version 4.1.0 (R Core Team, 2021). To assess guideline adherence, we operationalized abovementioned recommendations into the following measures:

(1) to investigate whether the recommendation was met that dosages should be evaluated weekly during the dose-finding phase, we checked whether there were at least four visits during the first 4 to 6 weeks after the first prescription. As the Dutch guidelines do not specify the duration of the dose-finding phase, we used the NICE guidelines (National Institute for Health and Care Excellence, 2009) as a reference, which recommends a dose-finding phase of 4 to 6 weeks (Table 1);

(2) to investigate whether monitoring of effectiveness thereafter was scheduled at least every 6 months, we calculated the intervals between two consecutive visits and counted the number of times each medical record had an interval longer than 6 months between two visits;

(3) to investigate if height and weight were measured and recorded in a growth chart at least annually, we counted the number of times each medical record had an interval longer than 12 months between two physical measurements; and

(4) we calculated the percentage of visits in which a validated questionnaire was used to assess treatment response (e.g., ADHD-Rating Scale (Zhang et al., 2005); Child Behavior Checklist (Achenbach and Rescorla, 2001); Teacher's Report Form (Achenbach and Rescorla, 2001); Strengths and Difficulties Questionnaire (van Widenfelt et al., 2003); and/or the Swanson, Noland, and Pelham Rating Scale (Bussing et al., 2008). These questionnaires are recommended in Dutch guidelines to assess ADHD symptoms and impairments).

We restricted our analyses regarding the dose-finding phase to children and adolescents who used methylphenidate for longer than 4 weeks ($n = 472$), the analyses regarding monitoring to children and adolescents who were treated longer than 6 months ($n = 396$), and the analyses regarding measuring height and weight to children and adolescents treated for at least 12 months ($n = 344$). We used

Table 1. Comparison of Recommendations Between the Dutch Multidisciplinary Guideline for the Assessment and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents and the National Institute for Health and Clinical Excellence Guideline for the Diagnosis and Management of Attention-Deficit/Hyperactivity Disorder in Children, Young People, and Adults

Dutch guideline (National Steering Committee Guideline Development in Mental Health Care, 2005)	*NICE (National Institute for Health and Care Excellence, 2009)*	*Operationalized measure*
Dosage should be uptitrated weekly in small dose increments against effectiveness and side effects (4.4.4.1).	During the dose-finding phase, symptoms and side effects should be recorded at each dose change on standard scales (e.g., Conners' 10-item scale) by parents and teachers, and progress reviewed regularly (e.g., by weekly telephone contact and at each dose change) with a specialist clinician. (10.18.9.1). Dosage should be titrated against symptoms and side effects over 4–6 weeks until dose optimization is achieved (10.18.9.2).	Number of visits during the first four to 6 weeks after the first prescription.
Adequate titrated children should be seen at least every 6 months to evaluate the effectives of the medication (4.4.4.2).	Following an adequate treatment response, drug treatment for ADHD should be continued for as long as it remains clinically effective. This should be reviewed at least annually (10.18.13.1).	Number of intervals longer than 6 months between two consecutive visits.
Height and weight should be measured and recorded in a growth chart at least annually (4.4.4.3).	Height should be measured every 6 months in children and young people. Weight should be measured 3 and 6 months after drug treatment has started and every 6 months thereafter in children, young people and adults. Height and weight in children and young people should be plotted on a growth chart and reviewed by the health care professional responsible for treatment. (10.18.11.2).	Number of intervals longer than 12 months between two visits were height and weight measured.
Validated questionnaires should be used to assess treatment response (4.4.4.1).	During the dose-finding phase, symptoms and side effects should be recorded at each dose change on standard scales (e.g., Conners' 10-item scale) by parents and teachers, and progress reviewed regularly (e.g., by weekly telephone contact and at each dose change) with a specialist clinician. (10.18.9.1). Health care professionals should consider using standard symptom and side effect rating scales throughout the course of treatment as an adjunct to clinical assessment for people with ADHD (10.18.11.1).	Percentage of visits where validated questionnaires were used to assess treatment response.

ADHD, attention-deficit/hyperactivity disorder; NICE, National Institute for Health and Clinical Excellence.

Pearson's chi-squared test statistics to examine differences in adherence between settings, both sexes, and children (4–9 years of age) versus adolescents (above 10 years of age). The lower age limit of adolescence was based on the definition of adolescence of UNICEF. A p-value of <0.05 was set to indicate statistical significance for all analyses.

We also repeated the analyses with extended periods, to examine if this changed the results, that is, we also checked whether there were at least four visits during the first 8 weeks after the first prescription, counted the number of times each medical record had an interval longer than 7 months between two visits, and counted the number of intervals longer than 13 months between two physical measurements.

Results

Descriptives

Our sample consisted of 376 boys (74.3%) and 111 girls (21.9%). Nineteen medical records (3.75%) did not report the child's sex. The mean age of the first prescription was 10.2 years (SD = 3.26), with no difference between boys (mean = 10.0 years, SD = 3.16) and girls (mean = 10.5 years, SD = 3.26). There were 259 children (51.3%) and 246 adolescents (48.7%) at the time of their first prescription. The mean age of the first prescription was 7.62 years (SD = 1.22) in children and 12.9 years (SD = 2.54) in adolescents.

Sufficient number of visits during the dose-finding phase

We found that only 5.5% of patients had at least four visits during the first 4 weeks of treatment (with 26.5% of patients having no visits in the first 4 weeks at all). In the first 6 weeks, 13.3% of patients had at least four visits (with 15.5% of patients having no visits in the first 6 weeks at all). We found no significant differences in the number of visits in the first 4 or 6 weeks between the mental health care and pediatric settings. See Table 2 for an overview. Extending the dose-finding phase to 8 weeks led to similar results (Supplementary Table S1).

There were no differences in the number of visits during the dose-finding phase between boys and girls (Supplementary Table S4). However, children were more likely to have four or more visits during the dose-finding phase than adolescents, both in the first 4 weeks (7.9% and 2.4%, $\chi^2 = 5.45$, $p = 0.017$) and in the first 6 weeks (18.6% and 8.20%, $\chi^2 = 8.79$, $p = 0.002$). This difference between children and adolescents was only significant in the pediatric setting; note, however, that the group sizes were small (Supplementary Table S7).

Table 2. Number of Visits in the First Four and First Six Weeks of Treatment with Methylphenidate in Mental Health Care and Pediatric Settings

First 4 weeks					*First 6 weeks*				
Visit frequency	*Total (%)*	*Mental health care (%)*	*Pediatrics (%)*	χ^{2a}	*Visit frequency*	*Total (%)*	*Mental health care (%)*	*Pediatrics (%)*	χ^{2a}
0	125 (26.5)	79 (25.6)	46 (28.0)	0.54	0	73 (15.5)	43 (14.0)	30 (18.3)	1.22
1	196 (41.5)	130 (42.2)	66 (40.2)	0.10	1	177 (37.5)	121 (39.3)	56 (34.1)	1.00
2	84 (17.8)	55 (17.9)	29 (17.7)	<0.00	2	116 (24.6)	77 (25.0)	39 (23.8)	0.03
3	41 (8.7)	29 (9.40)	12 (7.30)	0.36	3	43 (9.10)	28 (9.10)	15 (9.10)	<0.00
4	22 (4.7)	13 (4.20)	9 (5.50)	0.15	4	38 (8.10)	25 (8.10)	13 (7.90)	<0.00
5	2 (0.40)	0 (0.00)	2 (1.20)	1.44	5	19 (4.00)	9 (2.90)	10 (6.10)	2.03
6	2 (0.40)	2 (0.60)			6	4 (0.80)	3 (1.00)	1 (0.60)	<0.00
					7	2 (0.40)	2 (0.60)		
At least 4	26 (5.50)	15 (4.80)	11 (7.70)	0.39	At least 4	63 (13.3)	39 (12.6)	24 (14.6)	0.21

Visit frequency = Number of follow-up visits in the first 4 or 6 weeks of treatment, respectively; Mental health care = mental health care setting; Pediatrics = pediatric setting; χ^2 = Pearson's chi-squared test statistic.

[a]None of the differences between settings was significant at an alpha level of 0.05.

Follow-up monitoring

In about one-third of the medical records (34.1%), the recommendation to monitor the treatment at least every 6 months was adhered to, that is, without having intervals longer than 6 months between two follow-up visits during their treatment with methylphenidate. The average duration of the intervals between visits was 3.26 months (SD = 4.33 months) and ranged between 0 (multiple visits during a month) and as long as 39 months. Adherence was significantly better in the pediatric setting with more patients seen at least every 6 months, compared with the mental health care setting (43.1% and 29.7%, $\chi^2 = 6.37$, $p = 0.012$, respectively). See Table 3 for an overview. Extending the interval to 7 months led to similar results, see Supplementary Table S2. There were no differences in the percentage of boys versus girls and of children versus adolescents who were monitored at least every 6 months (Supplementary Tables S5 and S8, respectively).

Table 3. Maximum Number of Intervals Between Two Follow-Up Visits That Were Longer Than Six Months for the Mental Health Care and Pediatric Settings

Longer than 6 months				
No. of intervals	*Total,* n *(%)*	*Mental health care,* n *(%)*	*Pediatrics,* n *(%)*	χ^2
0	135 (34.1)	79 (29.7)	56 (43.1)	6.37[a]
1	126 (31.6)	89 (33.5)	36 (27.7)	1.09
2	64 (16.2)	48 (18.0)	16 (12.3)	1.72
3	36 (9.10)	23 (8.60)	13 (10.0)	0.06
4	20 (5.10)	14 (5.30)	6 (4.60)	<0.00
5	11 (2.80)	10 (3.80)	1 (0.80)	1.89
6	2 (0.50)	1 (0.40)	1 (0.80)	<0.00
7	2 (0.50)	1 (0.40)	1 (0.80)	<0.00
8	1 (0.30)	1 (0.40)		

Number of intervals = Maximum number of times the interval between two follow-up medication visits was longer than 6 months; Mental health care = mental health care setting; Pediatrics = pediatric setting; χ^2 = Pearson's chi-squared test statistic.

[a]Chi-squared test statistic is significant ($p = 0.012$).

Height and weight

Both body height and weight were recorded in a growth chart at least annually in 24.7% of patients treated for at least 12 months. In 59% of patients, height and weight were never recorded together in a growth chart. In some patients only height or weight was measured. Height was measured at least annually in 51.5% of all patients and weight was measured at least annually in 47.1% of all patients. In 13.1% of patients, height was never recorded, in 5.5%, weight. Comparing the two settings, height and weight were recorded together in a growth chart at least annually more often in the mental health care setting (30.5%) than in the pediatric setting (15.7%; $\chi^2 = 8.86$, $p < 0.01$). The mental health care setting also separately measured height (57.1% vs. 42.5%; $\chi^2 = 6.41$, $p = 0.01$) and weight (54.8% vs. 35.1%; $\chi^2 = 11.9$, $p < 0.01$) at least annually more often than the pediatric setting. Extending the interval to 13 months led to similar results, see Supplementary Table S3. Absent annual recording of height occurred more often in boys than in girls, mainly in the mental health care setting. We did not find differences between boys and girls regarding weight monitoring (Supplementary Table S6).

Absent annual recording of height and weight occurred more often in children than in adolescents (Supplementary Table S9).

Questionnaires

The use of validated questionnaires to assess treatment response was registered in only 2.3% of the visits. We found no significant difference between the mental health care (2.3%) and pediatric (2.2%) settings. There was no difference in the use of questionnaires between boys (2.55%) and girls (2.10%). However, questionnaires were significantly more often used in children than in adolescents (4.11% and 1.42%, $\chi^2 = 25.5$, $p < 0.001$).

Discussion

We examined whether treatment with methylphenidate in clinical practice was in line with recommendations of the Dutch guidelines in children and adolescents in the Netherlands (National Steering Committee Guideline Development in Mental Health Care, 2005) by an audit of medical records. Overall, we found that guideline adherence was low. Only a very small percentage of children and adolescents were seen at least four times during the

dose-finding phase (5.5% had four visits in the first 4 weeks and 13.3% in the first 6 weeks), with no difference between boys and girls. This indicates that the titration phase may have been suboptimal in the far majority of patients. Our results are in line with a study from the United States, where patients also had limited contact with their primary care providers after initiation of medication for ADHD (Epstein et al., 2008).

Low guideline adherence in the dose-finding phase may lead to suboptimal treatment, as indicated by the large difference in treatment effects between optimally titrated medication and community care, according to the multimodal treatment study of ADHD (MTA) (Group, 1999). More children than adolescents were seen at least four times during the dose-finding phase, indicating that clinicians are stricter during the dose-finding phase when younger children start treatment with methylphenidate.

Guideline adherence regarding monitoring of effectiveness and safety after the dose-finding phase was also subpar, as only a little more than one-third of patients were seen at least every 6 months, with no difference between boys and girls or children and adolescents. Furthermore, adherence was also insufficient regarding the monitoring of height and weight and use of growth charts. We found that this was done at least annually in just over half of patients. This could lead to missing possible deviations from expected growth and/or weight related to methylphenidate use. A recent meta-analysis concluded that long-term methylphenidate treatment can result in reduced height and weight. However, it was stated that this reduction is likely to be of minimal clinical significance for most individuals (Carucci et al., 2021), hence regular monitoring may be especially important in children with a low expected adult height or body weight, or nutritional issues. We found that in the mental health care setting recording of height occurred less often in boys than in girls; and recording of height and weight less often in children than in adolescents.

The latter indicates that monitoring of physical measurements may be felt less important by clinicians when a child starts with methylphenidate. The most recent Dutch guidelines (Akwa, 2019) are even stricter regarding the monitoring of height and weight, recommending to measure and record these in a growth chart at least every 6 months. They also include strategies to counter weight loss and growth suppression, for example, taking medication after, instead of before food intake, consuming healthy high-calorie meals, or temporarily discontinuing drug treatment.

The use of questionnaires to assess treatment response was almost completely absent in both settings (in only 2.3% of patients' questionnaires were used). A possible explanation for their limited use is that most guidelines do not provide clear recommendations of which questionnaires to use and how to use them. This still remains a part of treatment that can be improved a lot, as using validated questionnaires may help ensure optimal dosing and optimal length of treatment (Akwa, 2019). Future guidelines may follow the Canadian ADHD Resource Alliance (2018), which offers an ADHD toolkit alongside their ADHD guidelines containing questionnaires, including the purpose and scoring instructions to be filled in during assessment, treatment, and follow-up visits.

In our comparison between child and adolescent mental health and pediatric settings, we found that more patients in the pediatric setting were seen every 6 months compared with patients in the mental health setting and that the recording of height and weight was better in the mental health care setting compared with the pediatric setting. A recent survey among Dutch health care professionals found that 64.5% of professionals made use of guidelines in diagnosing ADHD, thus one in three professionals did not use guidelines. Of the professionals who did use guidelines, 39.4% were using a protocol of their own institution (Levelink et al., 2019). These protocols may not include all regular guideline recommendations, which could result in lower adherence to recommendations from regular guidelines. The use of institutional protocols instead of (inter)national guideline may also have occurred by the professionals treating the patients in our study.

Training of health care professionals to improve awareness and implementation of guidelines could improve guideline adherence. One study found that 5 hours of training increased the use of parent and teacher rating scales from around 50% to almost 100% of the patients with ADHD and improved the percentage of patients in whom medication response was monitored systematically to 40% of patients compared with 9% pretraining (Epstein et al., 2008). Training programs may also address barriers to guideline adherence such as a general dislike of guidelines, lack of self-efficacy (Cabana et al., 1999), or time constraints (Lugtenberg et al., 2016). Yet another way of improving guideline adherence could be the inclusion of guideline recommendations within electronic medical record templates. Randomized controlled trials have shown that this improves guideline adherence with regard to ADHD diagnosis (Carroll et al., 2013), the inclusion of parent and teacher rating scales for the assessment of ADHD, and the use of teacher rating scales to monitor treatment responses (Epstein et al., 2011).

However, it should be acknowledged that it is not always feasible to implement all guideline recommendations in clinical practice, due to time constraints or lack of staff. Some recommendations, such as scheduling four visits during the dose-finding phase, may only be feasible if more clinicians would be available (Kendrick et al., 2016). Therefore, we should also look critically at how we can close the gap between guidelines and clinical practice, by making guidelines more feasible rather than solely focusing on higher guideline adherence. Brief telephone visits or video consultations for example, could be of great help during the dose-finding phase and more achievable for families. Clinics could also try to make adherence more feasible by considering rearrangements of tasks traditionally done by physicians.

A strength of our study was the use of a relatively large sample within two settings. While the use of medical files represents a more objective method compared with self-reports, it may have resulted in a possible underestimation of guideline adherence, as we could not distinguish nonadherence from failing to record information in the medical records. In the minority of the cases where four visits were recorded during the dose-finding phase, we still do not know whether the optimal dosage was indeed achieved with weekly uptitration as recommended by guidelines. We could also not investigate some other important guideline recommendations, for example, how well possible side effects were assessed, and if heart rate and blood pressure were regularly measured. A lack of information in the medical file regarding assessment of side effects could indicate both the absence of side effects or a lack of adherence to assess these. Unfortunately, we did not have data on the number of clinicians, meaning we could not calculate possible effects of differences between clinicians.

Future research may combine reviewing medical records with surveys among clinicians and/or patients and their caretakers, thus also assessing care patterns that are not well captured from medical records. Also, it is uncertain to what extent our findings are representative and can be translated to other countries or other types of child care organizations, as variance in treatment ideology and insurance, and availability of treatment may influence guideline adherence. Furthermore, our data are somewhat dated, and it is

possible that guideline adherence has changed recently. However, as guidelines have become even stricter regarding measuring height and weight, future research should investigate if this has impacted guideline adherence.

Based on our findings, a number of improvements should be made in clinical practice. First, titration needs to be improved by having weekly visits during the dose-finding phase while using validated questionnaires to assess the effects of various dosages in an effort to find the optimal dosage. The MTA study has shown how much treatment gains can be obtained by ensuring an optimal dosage. Second, there should be regular long-term monitoring. Suboptimal monitoring may lead to less-effective long-term treatment, as potential useful dosage adjustments (e.g., due to getting older) might be missed, and perhaps also resulting in a proportion of patients who unnecessarily continue to use methylphenidate. Regular monitoring can also improve the recording of body height and growth, resulting in lower cases of unacceptable growth suppression due to treatment with methylphenidate. Paying attention to the current gaps in guideline adherence can greatly improve treatment effectiveness and safety for children and adolescents with ADHD. Adherence may be improved with training of clinicians and incorporating guideline recommendations within electronic medical record templates.

However, future research should also focus on how we can improve the feasibility of guideline recommendations in general practice. Furthermore, studies should look into the added value of using questionnaires or other more objective means such as child observations in improving the effectiveness of ADHD medication in clinical practice.

Conclusions

Guideline adherence on the four recommendations regarding methylphenidate initiation and monotoring was low. Only a fraction of patients was seen frequently enough in the dose finding phase and with no difference between the two settings. Around one-third of patients were followed-up at least every six months and this recommendation was adhered to more often in the pediatrics settings. Recording of height and weight was subpar, but done more often in mental health care settings. The use of validated questionnaire was almost absent in both settings.

Clinical Significance

Based on our findings, a number of improvements should be made in clinical practice. First, titration needs to be improved by having weekly follow ups during the dose-finding phase while using validated questionnaires to assess the effects of various dosages in an effort to find the optimal dosage. The MTA study has shown how much treatment gains can be obtained by ensuring an optimal dosage. Second, there should be regular long-term monitoring. Suboptimal monitoring may lead to less-effective long-term treatment, as potential useful dosage adjustments (e.g., due to getting older) might be missed, and perhaps also resulting in a proportion of patients who unnecessarily continue to use methylphenidate. Regular monitoring can also improve the recording of body height and growth, resulting in lower cases of unacceptable growth suppression due to treatment with methylphenidate. Paying attention to the current gaps in guideline adherence can greatly improve treatment effectiveness and safety for children and adolescents with ADHD. Adherence may be improved with training of clinicians and incorporating guideline recommendations within electronic medical record templates. However, future research should also focus on how we can improve the feasibility of guideline recommendations in general practice. Furthermore, studies should look into the added value of using questionnaires or other more objective means such as child observations in improving the effectiveness of ADHD medication in clinical practice.

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Authors' Contributions

P.T.R.: Methodology, acquisition, analysis, interpretation of data, and writing—original draft, review, and editing. A.D.: Methodology, writing—review and editing, and supervision. A.F.M.M.: Methodology, acquisition of data, and writing—review and editing. R.K.-D.: acquisition of data, and writing—review and editing. G.H.H.L.-N.: Acquisition of funding and data, and writing—review and editing. J.K.B.: Acquisition of funding and data, and writing—review and editing. B.J.H.: methodology, acquisition of funding and data, writing—review and editing, and supervision. P.J.H: methodology, acquisition of funding and data, writing—review and editing, and supervision.

Disclosures

P.T.R., A.-F.M.M., A.D., R.K.-D., G.H.H.L.-N., and B.J.H. report no competing interests. J.K.B. has been in the past 3 years a consultant to/member of advisory board of/and/or speaker for Takeda/Shire, Roche, Medice, Angelini, Janssen, and Servier. He is not an employee of any of these companies, and not a stock shareholder of any of these companies. He has no other financial or material support, including expert testimony, patents, or royalties. P.J.H. has been member of an advisory board meeting for Takeda/Shire.

Supplementary Material

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