

Shared Care Models in the Treatment of Pediatric Attention-Deficit/Hyperactivity Disorder (ADHD): Are They Effective?

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Abstract

Objectives: The aim of this review is to evaluate the effectiveness of shared/collaborative care between mental health-care providers and primary care providers (PCPs) on the outcomes of children and adolescents with attention-deficit/hyperactivity disorder (ADHD). This evaluation will be very helpful in the allocation of ADHD resources for models with the strongest evidence.

Methods: Using the Preferred Reporting Items for Systematic Review and Meta-analysis statement, we searched for randomized controlled trials, cohort, case-control, and cross-sectional studies on shared/collaborative care models in the treatment of ADHD. Using MEDLINE, PsycINFO, and CENTRAL databases from January 2000 to December 2016, we retrieved English language articles for review. The validation search identified 75 records. Five studies met the inclusion criteria and were analyzed in this systematic review. There were insufficient data for a meta-analysis. The included studies involved 655 children and adolescents who had a diagnosis of ADHD. The Cochrane Collaboration's tool for assessing risk of bias was used to estimate bias.

Results: Overall, the results show that the effects of shared/collaborative care models were small to moderate (effect size: 0.1-0.6, $P = .04$) on symptom rating scales, but all positively affected functional outcomes (effect size: 0.3-0.7, $P = .04-.01$). The data indicated that the models were associated with increased PCPs' comfort levels, but the evidence for increased capacity for diagnosing and managing ADHD was weaker.

Conclusions: This review concludes that the current studies do not show strong evidence for the outcome of collaboration between PCPs and mental health professionals on ADHD management. Future research should consider providing education to PCPs on management guidelines prior to conducting the trials, and more innovation is needed to discover methods of collaboration that affect the direct care of ADHD.

Keywords

shared care, collaborative care, attention-deficit/hyperactivity disorder, children, adolescents

Introduction

Approximately 5% of children and adolescents are diagnosed with attention-deficit/hyperactivity disorder (ADHD) in North America.^{1,2} The disorder causes significant morbidity,^{3,4} but nearly 50% to 67% of this population is not treated by a psychiatrist.^{5,6} Primary care providers (PCPs) have a central role in treating this condition, as estimates indicate that ADHD is one of the 3 most common disorders seen in primary care settings.⁴ However, research suggests that many PCPs have insufficient knowledge, skills, or time to optimally diagnose and manage ADHD.^{7,8} This gap can lead to long-term negative consequences for patients.

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Shared care or collaborative care, which will be used synonymously in this article, is based on multidisciplinary collaboration and enhancement of PCP's capacity.⁹ It is an approach to care that uses the skills and knowledge of a range of health professionals who share joint responsibility in relation to an individual's care.¹⁰ Shared/collaborative care models between mental health-care providers and PCPs are a popular method of bridging the gaps between resources and needs.

A position paper published by the Canadian Psychiatric Association and the College of Family Physicians of Canada stated, "Collaborative models have improved access to mental health care and increased the capacity of primary care to manage mental health and addiction problems. Successful projects in Canada and other countries have demonstrated better clinical outcomes, a more efficient use of resources, and an enhanced experience of seeking and receiving care."^{11(p.1)} Despite this enthusiastic endorsement, few studies have examined the evidence that tests whether these shared care models actually improve care, particularly for child and adolescent psychiatric diagnoses.

For example, the largest systematic review and meta-analysis examined the effects of collaborative care in the management of depression. These researchers primarily explored adult studies, as out of the 39 study arms only 1 arm targeted adolescents. They concluded that there was strong evidence to support the effectiveness of collaborative care models in the management of depression, particularly at the primary care level.¹² The Ontario College of Family Physicians developed the Collaborative Mental Health Care Network (CMHCN), a mentoring program to help its family physician members to provide mental health care to their patients. In a pilot project assessing this program, 88% of the participants ($n = 100$) reported that CMHCN has helped with improved patient care.¹³ But do these models work in pediatric ADHD?

We aim to provide data based on evidence-based medicine (EBM) principles. Evidence-based medicine is defined as "the process of systematically finding, appraising, and using contemporaneous research findings as the basis for clinical decisions."¹⁴ Physicians practicing EBM are more likely to be aware of and implement the most efficacious interventions. As a result, this may raise the level of care as well as the patient's quality of life.¹⁵

Therefore, we conducted this study to determine whether ADHD collaborative care models between psychiatrists and PCPs have positive effects on the outcomes of children and adolescents and whether they increase the capacity and comfort levels of PCPs in assessing and treating pediatric ADHD. In the last section of the article, we offer interpretations of these data, concluding with suggestions for the focus of future research.

Methods

Data Sources

The following databases were searched: MEDLINE, PsycINFO, and the CENTRAL using the Ovid interface by a

librarian experienced in systematic reviews. Searches were restricted to English and to material published since 2000. Records retrieved by the electronic search were downloaded and imported into Mendeley Reference Manager database. The titles and abstracts were appraised against the inclusion criteria by the 3 reviewers independently (M.A.S., K.A.P., and C.S.P.). The papers were identified as "retained" or "excluded." Disagreement was resolved through discussion and reaching to a consensus regarding article selection. Papers were selected if at least 2 of 3 reviewers agreed.

Study Selection

The inclusion criteria were studies examining the effectiveness of shared/collaborative care in a pediatric population diagnosed with ADHD. We examined randomized controlled trials, cohort, case-control, and cross-sectional studies. The studies had to be with at least 6 months duration of follow-up. The setting could be based in a clinic, hospital, or school. We excluded case series, case reports, individuals age 19 and above, animal studies, and publications before year 2000.

As a validation measure, the authors conducted an independent search on PubMed database using the following keywords: ADHD, psychiatrist, psychologist, social worker, mental health nurse, shared care, and collaborative care.

To facilitate the assessment of possible risk of bias for each study, we collected information using the Cochrane Collaboration tool for assessing the risk of bias (Table 8.5.a in the Cochrane Handbook for Systematic Reviews of Interventions). A judgment as to the possible risk of bias on each domain was made from the extracted information, rated as "high risk" or "low risk." The following domains were assessed: selection, performance, detection, attrition, and reporting bias.

Data Synthesis

We planned on conducting a meta-analysis if there were enough studies to extract data, and if not, we planned on a systematic review. In total, 2483 records were identified through the initial database search. After examining the first 250 abstracts and only finding one that was relevant, we decided to revise our search strategy. From the records identified, a search was conducted using the following keywords: ADHD, psychiatrist, psychologist, social worker, mental health nurse, shared care, and collaborative care. The validation search identified 75 records, which were reviewed by the 3 authors, all blinded to the reviews of the other 2. Fourteen were retained. Five met the inclusion criteria and were included in this review (Figure 1).

Results

The included studies primarily examined school-age children and adolescents and were conducted in outpatient clinic setting. All 5 studies finally selected were published in English.¹⁶⁻²⁰ The main inclusion criteria entailed assessment

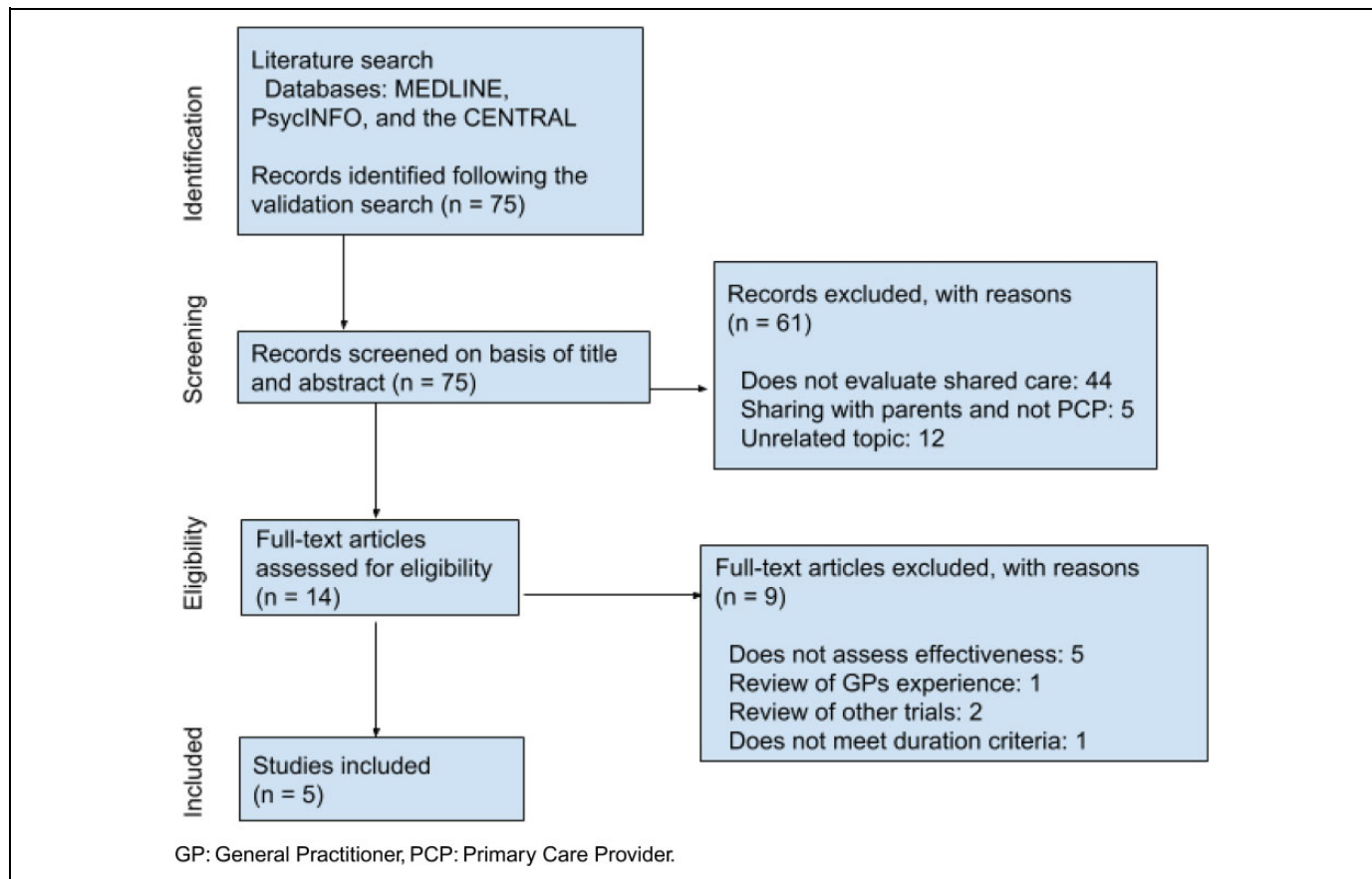


Figure 1. Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) flow diagram.

of collaborative/shared care in pediatric ADHD. The included studies involved 655 children and adolescents who had a diagnosis of ADHD. The participants were in the age range of 5 to 17 years. The duration of the follow-up period varied from 6 to 24 months. The settings included primary care or pediatric clinics. All trials were conducted in the United States. There were insufficient data to do a meta-analysis.

Included Studies' Design

The design of the included studies was variable. Three studies used a prospective cohort design.^{16,17,19} The others used the following designs: a randomized controlled cluster trial¹⁸ and a randomized comparative effectiveness trial.²⁰ In 4 studies, the outcome assessed was ADHD symptoms and functioning.^{16,18-20} Three studies assessed PCPs' satisfaction.¹⁷⁻¹⁹ The quality of the studies varied. The risk of bias is described below.

Attention-deficit/hyperactivity disorder Symptoms Improvement

The included studies assessed the changes in symptoms using parent-, teacher-, and clinician-completed rating scales. Overall, there was a modest positive change in these scores in the shared/collaborative care programs. However, in addition to the

availability of consultant psychiatrists, other variables may have contributed to the observed improvement. A summary of the findings, regarding changes in ADHD symptoms, and possible contributing factors will be described in the following paragraphs.

A randomized trial showed small effect sizes (ES) for symptom improvement on the Vanderbilt Parents' rating scale (ES: 0.07-0.12) and on the Clinical Global Impression (CGI) scale (ES: 0.28; $P = .04$).¹⁸ High rates of comorbid mental health conditions in this study, for example, oppositional defiant disorder and anxiety disorders, have probably contributed to the minimal response to treatment.

Two nonrandomized studies showed mild to moderate improvement in symptoms on the CGI–Severity scale as well as on the Vanderbilt Parents' and Teachers' rating scales.^{16,19} One nonrandomized study revealed some improvement in functioning on the Children's Global Assessment Scale.¹⁶ In the latter study, the direct communication between pediatricians and psychiatrists over the telephone as well as the availability of the psychiatrists to conduct an evaluation if needed probably contributed to the observed improvement.¹⁶ On the other hand, lack of blinding might have been associated with performance bias, for example, participants reporting higher levels of improvement in the self-rating scales. In the study by Myers et al,¹⁹ the involvement of care managers (CMs) in providing education to families in addition to their role in

liaising between pediatricians and psychiatrists was likely associated with the reported positive change.

In one randomized trial, the ES for improvement in ADHD symptoms of hyperactivity and impulsivity, based on Swanson, Nolan, and Pelham, version IV (SNAP-IV) scale, was large (ES: 0.57; $P = .04$); however, the score on self-rating scales at 12 months was 18% improvement in the Enhanced Care Group compared to 6% in the Basic Care Group.²⁰ These relatively low percentages of improvement may be explained by 28% compared to 48% not receiving ADHD medication as well as 48% compared to 50% not receiving behavioral interventions in the Enhanced and Basic Collaborative Care groups, respectively.

Primary Care Providers' Capacity and Comfort Level

In the studies assessing PCPs, satisfaction surveys were used. One study indicated that PCPs had high level of satisfaction regarding improvement in capacity.¹⁷ Multiple factors have likely contributed to the reported satisfaction. Expedited access to a psychiatric consultation, that is, within less than 3 weeks, in the study by Fallucco et al,¹⁷ probably contributed to the increased satisfaction level. Additionally, all PCPs in this study participated in specialized training in the management of mental illness.¹⁷

In regard to enhanced capacity, the randomized trial by Kolko et al¹⁸ revealed the absence of significant differences between the 2 groups in the PCPs' perceived change in skills. A survey in this trial reported no differences in PCPs' perceived skills in providing services for behavioral problems at 12 months compared to baseline.¹⁸ The absence of change in perceived enhanced capacity from baseline may be explained by the level of experience of the participants, for example, work experience for 12 years in average, 97% being board certified, and 80% completing a rotation in child psychiatry during their clinical training. However, in this trial, PCPs in the intervention group were 4 to 5 times more likely to prescribe ADHD medication.¹⁸ This was probably related to the active role of CMs in liaising with a child and adolescent psychiatrist, in addition to their involvement with the PCP and the family in administering ADHD medication.

The impact of telephone consultations on reducing referrals to psychiatrists, that is, increased comfort level of treatment by PCP, was examined by Aupont et al.¹⁶ In this study, 42% of the cases did not require a further referral for a psychiatric assessment and these patients were retained in primary care.¹⁶ This may indicate the effectiveness of the telephone consultation model. However, other factors that could explain the reason of this finding were not examined in this study, for example, physicians' baseline comfort level in managing ADHD and characteristics of the retained patients, for example, illness severity, comorbidities, and social and environmental variables (Table 1).

Risk of Bias

The quality of the studies varied, as mentioned above. Randomization was inadequate in 4 of the studies.¹⁶⁻¹⁹ In the study by

Aupont et al,¹⁶ participants and outcome assessment were not blinded, which increases the risk of performance and detection bias. In the study by Fallucco et al,¹⁷ random sequence was not generated and participants were not blinded. These factors increase the risk of selection and performance bias. In the study by Kolko et al,¹⁸ cluster randomization was used, which increases the risk of recruitment bias. In the study by Myers et al,¹⁹ the participants were not blinded and there was no random sequence generation. These factors increase the risk of performance and selection bias. In the study by Silverstein et al,²⁰ no contributions to bias were identified.

Discussion

As mentioned in the background, there are few studies that explored collaborative care in pediatric mental health. The most well-searched condition was depression. A systematic review only had 1 arm of depression in adolescents.¹² The positive effects may be related to having arms of adults. Diagnosing depression is more straightforward in adults compared to pediatric patients, and therefore, collaboration may be easier.

A randomized clinical trial assessing the effectiveness of collaborative care for adolescents with depression revealed that the intervention group had greater decreases in rating scale scores compared to the control group. In this study, intervention was delivered by master-level clinicians in the role of CMs. They provided cognitive behavioral therapy, assisted with antidepressants medication choice according to an expert's opinion-based algorithm, and followed up with the participants every 1 to 2 weeks. Regular team meetings occurred in the presence of the study psychiatrist.²¹ The positive effects may be related to the combination of psychotherapy and pharmacotherapy, as well as the short interval follow-ups.

To our knowledge, this is the first review of the effectiveness of collaborative care models in the treatment of pediatric ADHD. Our goal was to answer the question: Are these models effective in treatment of pediatric ADHD?

Between 2000 and 2016, 5 trials assessed the effectiveness of collaborative care in children and adolescents with ADHD. In these trials, the intervention as well as outcome measures varied. Some studies had CMs who liaised between PCPs and psychiatrists.¹⁸⁻²⁰ Other studies provided direct telephone consultation¹⁶ or expedited access to psychiatry services.^{16,17} The outcome was more robust when CMs had a more active role, training courses were provided to PCPs, and easier access to psychiatrists was available.

In terms of outcome measures, some studies used scales assessing a general clinical impression, for example, CGI,^{16,18} while other studies used more specific ADHD symptom-based scales, for example, the Vanderbilt Assessment Scale^{18,19} or the SNAP-IV rating scale.²⁰ Included studies also assessed PCP capacity building and comfort level, based on surveys¹⁷⁻¹⁹ or rate of return to their care.^{16,17}

Overall, the evidence for the effectiveness of shared/collaborative care models in achieving clinically meaningful improvements in ADHD in the pediatric population was low

Table 1. Characteristics of Included Studies.

Author(s) (n), Study Design	Country	Setting	Age (years)	Gender	Intervention	Follow-Up Period (months)	Primary Outcome (Effect on Symptoms)	Other Outcomes
Aupont et al ¹⁶ (n = 129), Prospective cohort	United States	Primary care/child psychiatry	Mean age (SD) = 12.3 (4.0)	Female 43%	Phone consultation with psychiatrists for pediatricians, and if necessary an evaluation within 4 weeks	18	CGI-S: Decrease from moderately severe to mild or borderline symptom levels. CGAS: Improvement from problems in more than 1 area of functioning to problems in 1 area only	Return to primary pediatrician for follow- up care: 48.8%
Fallucco et al ¹⁷ (n = 26), Prospective cohort	United States	Primary care/child psychiatrists	Mean age (SD) = 12.1 (3.6) years	Female 45%	A consultation model offering PCPs expedited access to outpatient psychiatric consultation (within less than 3 weeks)	24	N/A	High PCPs' level of satisfaction regarding improved skills in mental health care. Return to PCP for follow-up care: 57%
Kolko et al ¹⁸ (n = 321), Cluster randomized trial	United States	8 pediatric clinics	5-12	Female 36%	CMs liaised between pediatricians and psychiatrists. CMs provided psychoeducation and skills training for families	18	VADPRS changes: Effect size 0.07- 0.12 (small); CGI improvement: effect size 0.28 (small), $P = .04$	PCP survey regarding skills in providing services for behavior problems: No change at 12 months compared to baseline
Myers et al ¹⁹ (n = 116), Prospective cohort	United States	2 pediatric clinics (1 urban and 1 rural)	6-12	Male 73%	CM provided education to parents and liaised between pediatricians and a psychiatrist	Up to 14	VADPRS > 1 SD improvement: 27.6% VADTRS > 1 SD improvement: 13.8%	Parents and pediatricians reported being very satisfied with the program
Silverstein et al ²⁰ (n = 63), Randomized comparative effectiveness trial	United States	2 primary care pediatric clinics	6-12	Male 69%	CMs liaised between PCPs and a decision support panel. CMs conducted motivational interviewing and Triple P training as needed	12	SNAP-IV hyperactivity/impulsivity score improvement: effect size 0.57 (large) $P = .04$; social skills score improvement: effect size 0.69 (large) $P = .01$	The score difference in SNAP-IV inattention was not statistically significant

Abbreviations: CGAS, Children's Global Assessment Scale; CGI-S, Clinical Global Impression–Severity; CM, care manager; N/A, not applicable; PCP, primary care provider; SNAP-IV, Swanson, Nolan, and Pelham, version IV Scale; Triple P, Positive Parenting Program; VADPRS, Vanderbilt ADHD Diagnostic Parent Rating Scale; VADTRS, Vanderbilt ADHD Diagnostic Teacher Rating Scale.

to medium and the quality of the studies varied. The improvement in symptoms was statistically significant, however, considered minimally to moderately effective from a clinical perspective. A randomized trial reported statistically significant reduction in SNAP-IV scores at 12 months for hyperactivity and impulsivity symptoms. However, the score reduction in the intervention group was by 0.53 from the baseline of 1.79.²⁰ This change is not considered clinically significant, as Swanson et al has used a cutoff criterion of average score of 1 or less at the treatment outcome on the SNAP-IV scale to define treatment success.²²

Primary care providers generally experience collaborative care as very helpful^{17,19}; however, only few randomized controlled trials have been conducted. The PCPs' satisfaction was high for the support that they received from the psychiatrists in these models; however, the experience of increased capacity was variable. The variability of the findings in regard to symptom outcome and PCPs' increased capacity is probably explained by the methodology differences.

Our study had several limitations. We only included studies published in English. Our initial search strategy identified an enormous number of irrelevant articles; therefore, it was not optimally useful. To mitigate these limitations, future research could explore studies published in different languages. Furthermore, the search strategy may include different types of collaborative care, for example, telemedicine, phone consults, electronic consults, and colocation of primary care and behavioral health providers. A strength of our study is that it was the first to our knowledge that has systematically reviewed the current literature on shared/collaborative care in children and adolescents with ADHD.

Conclusions

Our review concluded that PCP collaboration with psychiatrists may be associated with increased comfort level. However, the association with symptom outcome and increased capacity was variable.

Future research may consider providing education to PCPs on management guidelines prior to conducting the trials. Furthermore, a model that includes telephone consultations may significantly reduce the number of patients who require full psychiatric assessments. Allocated funding to these studies is highly warranted as they can result in long-lasting capacity building. We propose that future research address the effectiveness of these models using randomized controlled trials on large sample sizes.

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Declaration of Conflicting Interests

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