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Primary Care-Based Models for the Treatment of Opioid Use Disorder: A Scoping Review

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Abstract

Greater integration of medication-assisted treatment (MAT) for opioid use disorder (OUD) in U.S. primary care settings would expand access to treatment for this condition. Models for integrating MAT in primary care vary in how they are structured. This paper summarizes findings of a technical report for the Agency for Healthcare Research and Quality (AHRQ) describing OUD MAT models of care, based on a literature review and interviews with key informants in the field. The report describes 12 representative models of care for integrating MAT in primary care settings that could be considered for adaptation across diverse healthcare settings. Common components of

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existing care models include (1) pharmacotherapy with buprenorphine or naltrexone, (2) provider and community education, (3) coordination/integration of OUD with other medical/psychological needs, and (4) psychosocial services/interventions. Models varied with respect to how each component is implemented. Decisions about adopting MAT models of care should be individualized to address the unique milieu of each implementation setting.

INTRODUCTION

The U.S. Department of Health & Human Services identifies opioid use disorder (OUD) as a national crisis (1). In 2014, approximately 1.9 million Americans 12 years or older were estimated to have OUDs linked to use of prescription opioids and nearly 600,000 used heroin (2). In 2013, an estimated 16,000 people died as a result of prescription opioid overdose and approximately 8,000 from heroin (3).

Medication-assisted treatment (MAT) for OUD, also referred to as “pharmacotherapy,” decreases illicit opioid use, prevents relapse, improves health, and reduces the risk of death from OUD (4). Medications currently approved by the U.S. Food and Drug Administration include a full agonist (methadone), partial opioid agonists (buprenorphine, buprenorphine/naloxone, and implantable buprenorphine), and opioid antagonists (oral and extended-release naltrexone). These medications block the euphoric and sedating effects of opioids, reduce craving for opioids, and/or mitigate opioid withdrawal symptoms. MAT is more effective than non-medication treatment alone in reducing opioid use (5, 6). Behavioral therapy addresses the psychosocial contributors to OUD and may augment retention in treatment. The Office of National Drug Control Policy (ONDCP) and the Department of Health & Human Services recently prioritized increasing access to MAT to address the OUD epidemic (1, 7).

Integrating MAT in primary care settings expands access to OUD treatment (8). The Drug Abuse Treatment Act (DATA) of 2000 enabled physicians to prescribe buprenorphine for treatment of OUD but use remains limited (3, 9, 10). Understanding the most effective and promising models of care is critical for optimizing initiatives to expand access to MAT (1). Because not all MAT models are published and outcomes of different MAT models have not been compared, the Agency for Healthcare Research and Quality (AHRQ) commissioned a scoping review to develop a taxonomy of OUD MAT models of care, focused on primary care settings.

METHODS

Scope of the Review

Our standardized review protocol and methods are detailed in the full report (11) (www.effectivehealthcare.ahrq.gov/reports/final.cfm). The review described representative MAT models of care in primary care settings and did not provide an exhaustive list of models for MAT integration. Representative models were selected based on their influence on current clinical practice, innovation, or their focus on MAT for specific primary care populations or settings.

Eleven key informants (8 nonfederal and 3 federal) with experience implementing OUD MAT in primary care setting were interviewed between March and June 2016 (Table 1). We facilitated small group telephone discussions using a semi-structured guide (Appendix A) asking participants to identify MAT models used in primary care, including unpublished models, and asked them to specify key model components. Calls were recorded, summarized and shared with the group for clarification and additional input. Based on Key Informant input, we developed a framework categorizing MAT model key components to provide a structure for future research and discussions. We then integrated input from the Key Informants with published and unpublished literature.

We searched for literature describing MAT models in primary care settings or their effectiveness from 1995 through June 2016 using Ovid Medline, PsycINFO, the Cochrane Library, SocINDEX, and CINAHL databases (Appendix B). We also reviewed reference lists and solicited additional references from Key Informants. We searched the grey literature (ClinicalTrials.gov, Health Services Research Projects in Progress (HSRProj), Google Scholar, NIH Reporter, and Web sites of government agencies with MAT initiatives), and sent an email notification to stakeholders about the opportunity to submit Scientific Information Packets for ongoing or unpublished research. The literature review provided descriptive/contextual information on the models to supplement Key Informant interviews. The search identified 5,892 abstracts; we reviewed 475 full text articles, 27 of which informed descriptions of MAT models of care, along with 13 grey literature citations (Table 2).

RESULTS

Key Informants consistently noted four key components of MAT models in primary care: (1) pharmacotherapy with buprenorphine or naltrexone; (2) provider and community educational interventions (e.g. in-person, web-based, and telehealth provider CME activities, community-based advertising campaigns, stakeholder conferences); (3) coordination/integration of OUD treatment with other medical/psychological needs; and (4) psychosocial services (e.g. counseling on-site or by referral). Models varied in the degree of component implementation.

Table 3 summarizes 12 representative models of MAT care and how the 4 key components are addressed. We included models that contained the 4 key components and met criteria for effectiveness, innovation, and/or addressing special populations (e.g. rural settings, HIV, prenatal care). Ten models were described by Key Informants, six in the published literature, and seven in unpublished/grey literature sources (Table 2). We categorized four models as primarily practice-based and 8 as systems-based, though most have elements of both. For each model, we discuss the clinician, practice, and system-level factors, including financing, evidence of effectiveness, challenges, and situations in which the model is most likely to be feasible and effective.

Practice-Based Models

Office-Based Opioid Treatment—In Office-Based Opioid Treatment (OBOT), physicians who complete 8 hours of training and receive a DEA waiver number may

prescribe buprenorphine/naloxone in the context of primary care (12, 13). While many providers offer OBOT without staff assistance, some practices designate a clinic staff member (often a nurse or social worker) to coordinate buprenorphine prescribing (14–16). Psychosocial services include on-site brief counseling provided by the physician or other staff and/or off-site referrals. OBOT is financed through provider reimbursement of billable visits. Medicare and many state Medicaid programs cover buprenorphine, though prior authorization is frequently required. The SAMHSA-funded Provider’s Clinical Support System for MAT (<http://pcssmat.org/>) is a free systems-level resource that supports OBOT implementation nationally with provider education and mentoring. Retention in treatment and opioid use outcomes with OBOT are comparable to methadone treatment programs, with 38% retention at 2 years and 91% of urine toxicology screens negative for opioid among those retained in one long-term cohort study (14).

OBOT may be particularly advantageous for reaching persons with OUD who are already engaged in primary care, and offers an alternative for patients who cannot access methadone treatment programs. Challenges include a variable scope of psychosocial services and structure required for management of complex patients. Also, nurse practitioners and physicians assistants—important providers of primary care in rural areas—are currently not eligible to prescribe buprenorphine.

Buprenorphine HIV Evaluation and Support Collaborative Model—The Buprenorphine HIV Evaluation and Support (BHIVES) Collaborative model adapted the OBOT framework to integrate buprenorphine in HIV primary care (17–26). HIV primary care providers in 9 HIV clinics provided buprenorphine along with HIV primary care, facilitated by a non-physician coordinator and variable on-site psychosocial services. The BHIVES cohort of 303 participants receiving buprenorphine demonstrated 49% treatment retention at 12 months; past 30 days opioid use decreased from 84% at baseline to 42% among those retained at 12 months (18). BHIVES is recommended as the standard of care for engaging HIV-infected patients with OUD in treatment (27–29). Buprenorphine and HIV care are typically covered by patient insurance. Ryan White Care Act (30) funding supplements medication coverage, care coordination and counseling services in some states. An advantage of the BHIVES model is that it addresses MAT, HIV care, and primary care within a single setting, and patients view this model as patient-centered (31). Challenges include limited financial support for on-site counseling in clinics without designated Ryan White funding. Provider’s Clinical Support System for MAT includes physician mentors with expertise in HIV care.

One Stop Shop Model—The One Stop Shop model was developed in response to an outbreak of HIV infection in rural Indiana due to sharing of infected syringes (32) where there were no prior OUD or HIV treatment services. Based in an existing mental health clinic, it provides integrated care for HIV and hepatitis C infection, MAT, mental health, primary care, and syringe exchange (33). A primary care provider embedded in the mental health clinic prescribes extended-release naltrexone as the primary pharmacological component as well as antiretroviral therapy. Financing is from a combination of existing Medicaid and federal funding. While comprehensive care is attractive in any setting, this

model might be particularly useful for rapid deployment in other specific OUD and HIV outbreaks. However, it requires rapid training of a willing local providers, state and federal resources for outbreak response, and its effect on outcomes and reproducibility in other settings has not been assessed.

Integrated Prenatal Care and Medication-Assisted Treatment—This model provides prenatal care to pregnant women who are treated with buprenorphine in primary care. Women receive prenatal and postpartum care, with OBOT buprenorphine maintenance continued following delivery. Psychosocial services are provided on-site in some practices, or through affiliated OTPs. While outcomes in primary care-based settings have not been assessed, outcome studies conducted in OTPs suggest that there is reduced Neonatal Abstinence Syndrome when pregnant women with OUD are maintained with buprenorphine rather than methadone (34, 35). This model is typically financed through existing Medicaid and other insurance reimbursement. Advantages include identification of women not previously engaged in OUD care, increased maternal motivation for OUD treatment due to concerns about the fetus, and provision of ongoing MAT maintenance in the postpartum period. A potential challenge is that the physician may reach their buprenorphine prescribing limit as more women seek to continue maintenance treatment following delivery.

Systems-Based Models

Medicaid Health Home Model—The Medicaid health home model is a flexible federal program through Centers for Medicare and Medicaid Services that allows states that apply for a Medicaid waiver to integrate MAT and behavioral health therapies with primary care for patients with OUD (36, 37). Primary care physicians prescribe buprenorphine as the primary pharmacotherapy, financed through usual Medicaid insurance coverage. Provider and community education (e.g. provider outreach, CME conferences, and community advertising) is emphasized to increase uptake by clinicians and patients and to decrease stigma. Robust psychosocial services are required. Demonstrations in Rhode Island and Maryland implemented Medicaid health home models in OTPs or psychiatric clinics, rather than in primary care clinic settings (37). States determine the structure of health care delivery, for example with Hub and Spoke models in Vermont, and approach to payment, which may include per member per month payments (Maryland) and weekly bundled payments (Rhode Island) that fund care coordinators in addition to other billable health care services. Advantages include required care coordination and core psychosocial services, an emphasis on provider and community education, and flexibility in enabling service delivery and provision according to the needs and resources of a particular state. Opioid health home models may be particularly well-suited for states with a high prevalence of OUD and state governments seeking payment structures that promote broader integration of primary care, psychosocial, and MAT services for OUD.

Hub and Spoke Model—The Hub and Spoke model, developed in Vermont, triages patients to two levels of care based on need during initial screening (38–41). “Spokes” are primary care clinics that provide MAT for less complex patients using an OBOT approach. “Hubs” are regional opioid treatment programs (OTPs) that care for more complex patients, dispense methadone if needed, support tapering off MAT, and provide consultative services

to the spokes. Following stabilization, patients initially managed at a hub may transfer to a spoke; conversely, patients managed in a “spoke” who require a higher level of care may be transferred to a hub. Buprenorphine has been the primary pharmacotherapy in this model. Vermont incentivized implementation of buprenorphine prescribing by funding online buprenorphine waiver training for “spoke” physicians and other technical assistance. They also incentivized “hubs” by funding behavioral health specialists. Coordination and integration occur between the hub and spoke and within each spoke, and is typically carried out by a registered nurse or clinician case manager. Psychosocial services are embedded within spokes, including social workers, counselors, and community health teams. The model is financed through a Medicaid health home model waiver state block grant. Its effect on outcomes has not been published. The Hub and Spoke model may be particularly suited for states with rural OUD populations where limited treatment services are available. Important advantages of the Hub and Spoke model include the availability of tiered care and integration of primary care with regional OUD management expertise, use of care coordinators and embedded psychosocial services at the spoke sites. Potential challenges include the unavailability of OTP hubs in all settings that wish to implement MAT.

Project Extension for Community Healthcare Outcomes—Project Extension for Community Healthcare Outcomes (ECHO) links primary care clinics in rural New Mexico with a university health system utilizing an Internet-based audiovisual network for mentoring and education (42–44) and has been adapted to support rural primary care providers in MAT management. It emphasizes nurse practitioner- or physician assistant-based screening with referral to a collaborating physician prior to initiation of MAT and for ongoing treatment. Counseling and behavioral therapies are offered from all ECHO team members during weekly teleconferences. Complex patients can be referred to an OTP. ECHO recruits physicians for buprenorphine waiver training and provision of continuing medical education in OUD. The ECHO model may be considered a rural adaptation of the Hub and Spoke or Collaborative Opioid Prescribing models, in that it engages the expertise of a virtual “hub” center to assist in provision of MAT via teleconference. It is financed through various federal grants and Medicaid. While patient-level outcomes have not been assessed, an ECHO program evaluation noted increased numbers of rural primary care providers with buprenorphine prescribing waivers per capita in New Mexico (42). Advantages include a strong emphasis on psychosocial services, Continuing Medical Education credits for teleconference participation, and collaboration with mid-level rural providers for initial screening. This model is well-suited for enhancing rural primary care provider capacity to treat patient with OUD. Challenges include limited availability of face-to-face expertise in MAT for high-risk patients, and lack of direct contact between off-site experts and patients.

Collaborative Opioid Prescribing Model—The Collaborative Opioid Prescribing model, developed in Maryland (45, 46), is another tiered model of care with centralized initial intake, buprenorphine induction and stabilization at an OTP, followed by transfer to primary care clinicians for ongoing MAT. Unlike the Hub and Spoke model, OTPs perform intake and induction/stabilization in all patients, and provide ongoing psychosocial services for patients transferred to primary care. Its effect on patient outcomes has not been assessed.

This model is likely to be well-suited for primary care practices that are geographically close to OTPs. Financing is through Medicaid and private insurance. Advantages are similar to Hub and Spoke, with the addition of ongoing OTP psychosocial services. Challenges include the geographic proximity required between OTP and primary care sites and limited OTP capacity to provide ongoing support as more patients transfer to primary care.

Massachusetts Nurse Care Manager Model—Massachusetts Medicaid reimburses nurse care managers in Federally Qualified Health Centers (FQHC) when supporting physicians to provide buprenorphine or naltrexone using either partial agonists or antagonists for opioid use disorders. The nurse care manager performs patient screening, intake, and education and scheduling with a prescriber and facilitates ongoing medical and OUD management. The prescribing physician confirms the OUD diagnosis and appropriateness of MAT and co-manages the patient with the nurse care manager. Psychosocial services are integrated on-site or nearby. Patients who require a higher level of care receive expedited OTP referral. The model is financed through direct Medicaid reimbursement to FQHCs for nurse care manager time as a billable service, in addition to usual Medicaid coverage for pharmacotherapy and physician visits. A cohort study of 408 pilot patients enrolled in this program reported 51% had engaged in buprenorphine treatment at one year and 91% of those retained on buprenorphine at 12 months had urine toxicology screens negative for opioids (47). Advantages include utilization of a skilled non-physician to offload prescribing physician burden, an emphasis on provider training, and financial sustainability through Medicaid-reimbursed nurse care manager visits. This model may be attractive over a wide range of primary care practices in states with Medicaid programs or other payers that could adopt reimbursement of nurse care manager visits for OUD. An evaluation of statewide scale-up noted a 375% increase in the number of buprenorphine-waivered physicians within 3 years (48). Challenges include variable availability of psychosocial services and nurse care managers trained in MAT management and, in most states, a lack of Medicaid coverage for nurse OUD care management.

Emergency Department Initiation of Office-Based Opioid Treatment—This model focuses on emergency department (ED) identification of OUD, and initiation of buprenorphine (49). ED physicians assess patients for OUD and begin buprenorphine induction in appropriate candidates during their ED visit. Patients are discharged with instructions for continuation of home induction and stabilization doses and connected to primary care OBOT for ongoing management. Brief physician counseling is performed during the ED visit and other psychosocial services vary. A randomized trial of ED-initiated buprenorphine versus referral or brief intervention demonstrated 78% engagement in buprenorphine treatment at 30 days compared with 37% in the referral group and 45% in the brief intervention group. The number of days of illicit opioid use per week decreased from 5.4 days to 0.9 days in the buprenorphine group versus 5.4 to 2.3 days in the referral group and 5.6 to 2.4 days in the brief intervention group (49). Medications, ED visits, and OBOT are funded through patient Medicaid and other insurance plans. This model is promising for scale-up to other ED settings with high prevalence of OUD and strong linkages to primary care OBOT. Advantages include enhanced access to MAT for patients who may not be accessing primary care or OTP, and improved engagement in OUD treatment compared with

passive referral. Potential challenges include added congestion in the ED as a means to access treatment.

Inpatient Initiation of Medication-Assisted Treatment—This model identifies OUDs among hospitalized patients, initiates MAT, and links to ongoing community-based treatment following discharge (50–52). Financing is from Medicaid and other insurance coverage, often requiring prior authorizations for outpatient prescriptions prior to hospital discharge. Linkage with ongoing psychosocial services varies. In one study, 72% of inpatients with OUD randomized to buprenorphine stabilization engaged in OBOT versus 12% of those randomized to buprenorphine detoxification (50). This model requires hospital support for initial development of inpatient consult services. Advantages include inpatient screening and initiation includes identification of patients with complex morbidity and high risk of mortality who may not otherwise access MAT, increased retention in care, and potential for linkage to OBOT for ongoing management. Patients initiated on methadone, which cannot be prescribed by primary care providers for OUD, would not be eligible for OBOT referral.

Southern Oregon Model—The Southern Oregon Model is an example of a local, informal model for MAT delivery in a network of rural primary care clinics. It focuses on OBOT with buprenorphine and utilizes regular meetings of regional stakeholders, including regional Medicaid-accountable care organizations (53) and primary care providers, for education, training, and development of practice standards around opioid prescribing for chronic pain and OUD treatment. Coordination or integration of care is variable and often limited, though an on-site clinical social worker is available in some clinics. The model is financed through direct support from Accountable Care Organizations and usual fee for service billing. The model may be well-suited for rural health providers in Affordable Care Act states with Accountable Care Organizations that promote community-wide support for opioid MAT. An advantage of this model is that it is a grass roots, community-based effort, which may promote buy-in from clinicians and the community to overcome stigma and resistance to MAT use. Challenges include lack of well-defined key components and limited psychosocial services and care coordination/integration.

DISCUSSION

Addressing the current U.S. OUD disorder epidemic will require diverse approaches over many years. Models of care that integrate MAT in primary care and other healthcare settings have the potential to expand access to OUD treatment and decrease the personal and societal impact of OUD. We identified 12 representative models of primary care-MAT integration that may be considered for adaptation and expansion across diverse healthcare settings.

All models contained some degree of four key components: (1) pharmacological therapy; (2) psychosocial services; (3) integration of care; and (4) education and outreach. Models varied in relative emphasis of these components, though common themes included the importance of a non-physician coordinator and use of tiered approaches. The ideal model of care for a particular setting likely depends on local factors such as available expertise, the population being served, proximity to an addiction center of excellence, reimbursement policies, and

geography. Decisions about MAT models of care should therefore be individualized to address the unique milieu of each implementation setting. It may be appropriate to combine elements of different models of care (e.g., implement nurse care manager care coordination within a Hub and Spoke model) or to link models of care (e.g., ED or inpatient based screening and initiation of treatment linked with OBOT).

Most MAT models (10 of 12) provided sublingual buprenorphine/naltrexone pharmacotherapy. Although implantable buprenorphine was approved by the Food and Drug Administration in 2016, research on its use in primary care settings is lacking. Two randomized trials demonstrate extended-release naltrexone efficacy for OUD in addiction treatment settings (54, 55), but its effectiveness for OUD in primary care settings has not been studied and use is limited. Expanding evidence-based, long-acting MAT options could broaden patient choices, reduce risk of diversion, and decrease need for frequent follow-up in appropriate patients.

As described in the full report (11), barriers to implementing MAT include lack of trained primary care providers, reimbursement models that do not support care coordination and psychosocial services, persistent stigma associated with MAT, and long travel times for patients in rural areas. Current models of care utilize various strategies to address barriers, such as integrating training and education, use of non-physicians, development of reimbursement models to support MAT delivery, use of tele-education, tiered care models, and engagement of stakeholders.

Our report has potential limitations. The specific models described are meant to provide a representative taxonomy of ways to integrate MAT and primary care, rather than an exhaustive list. No study has compared outcomes of different MAT models of care and some models have not been reported in the published literature. Therefore, we supplemented literature searches with Key Informant interviews and grey literature searches and utilized a descriptive approach. Other challenges include overlapping characteristics of models of care, variable levels of structure, and adaptation to specific settings.

Important areas of uncertainty, described in the full report (11), include optimal methods for measuring quality of MAT care, assessment tools to better individualize care, optimal psychosocial components of MAT, cost and cost effectiveness, methods for reducing diversion, optimal methods for coordination and integration of care, and the effectiveness of mid-level prescribing, newer MAT, and telehealth and telemedicine approaches. Research in these areas would inform future efforts at dissemination and expansion of MAT in primary care settings.

In summary, existing MAT models of care can inform expanded implementation in primary care settings. Decisions about adopting MAT models of care should consider the advantages and disadvantages of each model, and should be individualized to address the unique milieu of each implementation setting.

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Appendix A. Sample Questions for Key Informants

Key Informant Perspective	Sample Questions
<p>Researchers and Clinicians (including Professional Societies and Organizations)</p>	<p>Guiding Questions 1, 2, and 4 from full AHRQ report (11). In addition:</p> <ol style="list-style-type: none"> 1 What outcomes should be prioritized? 2 In your experience, what MAT models of care have been particularly successful and why? 3 Are there models of care that are particularly suited (e.g., feasibility, applicability) for rural or other underserved settings? 4 How would you categorize the components of MAT models of care? 5 What MAT models of care components are most critical for effectiveness? 6 What are barriers to implementation of MAT in primary care settings? 7 What are specific barriers to implementation of community-based psychosocial programs in MAT? 8 How could barriers to implementation be overcome? 9 Are you aware of new or innovative models of care that warrant additional research? 10 What are key research needs to understand effectiveness and implementation of MAT models of care? 11 What types of study designs would be useful for studying new or innovative MAT models of care? 12 What is a meaningful length of followup? 13 Are there specific areas related to effectiveness or implementation of MAT models of care that have been sufficiently studied to warrant a systematic evidence review?
<p>Health Policy and Implementation Arenas</p>	<ol style="list-style-type: none"> 1 What outcomes of MAT are important from a health policy/payer perspective? 2 What policies do payers put in place to influence use of MAT for treatment of opioid use disorder? 3 How are decisions to cover or implement MAT made at a policy level or at an institutional/clinical setting level? 4 What are some research questions about MAT that you would like answered to inform policy and implementation decisions? 5 Are you considering new policies to improve the use of MAT, particularly in primary care, including rural or other underserved populations? 6 What are cost and/or economic efficiency considerations that impact diffusion, decision-making, and/or conceptual thinking around MAT?

Key Informant Perspective	Sample Questions
Patient Perspective	<ol style="list-style-type: none"> 1 What values do patients place on various non-substance-use-related outcomes and how do patients weigh trade-offs related to different pharmacological and non-pharmacological approaches? 2 What factors or themes are most important to patients receiving MAT? 3 What components of MAT are important for patients to know, that they may not be aware of? 4 What common experiences do patients in MAT programs describe? 5 Should the use of MAT programs be expanded; and if so, what settings for patients are most amenable to the implementation of MAT? 6 What barriers do patients experience in obtaining MAT? 7 What suggestions do patients have for improving MAT models of care? 8 What are ethical, privacy, equity, or cost considerations that impact patient's use of MAT?

Abbreviation: MAT = medication-assisted treatment

Appendix B. Search Strategies

Database: Ovid MEDLINE

1. exp Opiate Substitution Treatment
2. exp Opioid-Related Disorders/dt, pc, px, rh, th
3. methadone.mp. or exp Methadone
4. buprenorphine.mp. or Buprenorphine
5. naltrexone.mp. or Naltrexone
6. suboxone.mp.
7. 3 or 4 or 5 or 6
8. 2 and 7
9. (medicat* adj3 assist* adj3 (treat* or therap* or regimen* or interven* or program*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]
10. ((opiate* or opioid* or narcotic*) adj2 (substitut* or replac* or maint*) adj2 (treatment* or therap* or regimen* or program* or interven*)).ti,ab.
11. 9 or 10
12. 2 and 11
13. 1 or 8 or 12
14. limit 13 to english language
15. exp Comprehensive Health Care/

16. exp Community Health Services/
17. exp Outpatients/
18. exp Ambulatory Care/
19. exp Ambulatory Care Facilities/
20. exp General Practice/
21. general practitioners/or physicians, family/or physicians, primary care/
22. exp Health Services Accessibility/
23. 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
24. (((primary or ambulatory) adj3 care) or ((family or general) adj3 (medicine or practice* or physician* or doctor* or practitioner* or provider*)) or outpatient* or ((communit* or comprehensiv*) adj3 (health* or care))).mp.
25. (rural* or underserv* or frontier* or (geograph* adj3 (isolat* or remot*))).mp.
[mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]
26. 24 or 25
27. 23 or 26
28. 14 and 27
29. limit 28 to yr="2005 -Current"
30. limit 28 to yr="1902 – 2004"
31. limit 14 to systematic reviews
32. limit 14 to (controlled clinical trial or guideline or randomized controlled trial)
33. exp epidemiologic study/
34. 14 and 33
35. Comparative Study/
36. 14 and 35
37. exp "Outcome and Process Assessment (Health Care)"/
38. 14 and 37
39. mo.fs.
40. exp Death/
41. exp Vital Statistics/
42. 39 or 40 or 41
43. 14 and 42

- 44. exp Evaluation Studies as Topic/
- 45. 14 and 44
- 46. exp "costs and cost analysis"/
- 47. 14 and 46
- 48. exp Sociological Factors/
- 49. 14 and 48
- 50. exp quality of life/
- 51. 14 and 50
- 52. exp health behavior/
- 53. 14 and 52
- 54. exp attitude to health/
- 55. 14 and 54
- 56. 31 or 32 or 34 or 36 or 38 or 43 or 45 or 47 or 49 or 51 or 53 or 55
- 57. 28 or 56

Database: EBM Reviews – Cochrane Database of Systematic Reviews

- 1. [exp Opiate Substitution Treatment/]
- 2. [exp Opioid-Related Disorders/dt, pc, px, rh, th]
- 3. methadone.mp. or exp Methadone/
- 4. buprenorphine.mp. or Buprenorphine/
- 5. naltrexone.mp. or Naltrexone/
- 6. suboxone.mp.
- 7. 3 or 4 or 5 or 6
- 8. 2 and 7
- 9. (medicat* adj3 assist* adj3 (treat* or therap* or regimen* or interven* or program*)).mp.
- 10. ((opiate* or opioid* or narcotic*) adj2 (substitut* or replac* or maint*) adj2 (treatment* or therap* or regimen* or program* or interven*)).ti,ab.
- 11. 9 or 10
- 12. 1 or 8 or 11

Database: EBM Reviews – Cochrane Central Register of Controlled Trials

- 1. exp Opiate Substitution Treatment/

2. exp Opioid-Related Disorders/dt, pc, px, rh, th
3. methadone.mp. or exp Methadone/
4. buprenorphine.mp. or Buprenorphine/
5. naltrexone.mp. or Naltrexone/
6. suboxone.mp.
7. 3 or 4 or 5 or 6
8. 2 and 7
9. (medicat* adj3 assist* adj3 (treat* or therap* or regimen* or interven* or program*)).mp.
10. ((opiate* or opioid* or narcotic*) adj2 (substitut* or replac* or maint*) adj2 (treatment* or therap* or regimen* or program* or interven*)).ti,ab.
11. 9 or 10
12. 1 or 8 or 11

Database: PsycINFO

1. exp opiates/
2. exp drug rehabilitation/
3. exp drug dependency/
4. 2 or 3
5. exp drug therapy/
6. exp methadone maintenance/
7. methadone.mp. or exp Methadone/
8. buprenorphine.mp. or Buprenorphine/
9. naltrexone.mp. or Naltrexone/
10. suboxone.mp.
11. 5 or 6 or 7 or 8 or 9 or 10
12. 1 and 4 and 11
13. (medicat* adj3 assist* adj3 (treat* or therap* or regimen* or interven* or program*)).mp.
14. ((opiate* or opioid* or narcotic*) adj2 (substitut* or replac* or maint*) adj2 (treatment* or therap* or regimen* or program* or interven*)).ti,ab.
15. 13 or 14
16. 1 and 4 and 15

17. 12 or 16
18. limit 17 to english language
19. exp Primary Health Care/
20. exp community services/
21. exp Outpatients/
22. exp outpatient treatment/
23. exp Maintenance Therapy/
24. exp Ambulatory Care/
25. exp Ambulatory Care Facilities/
26. exp General Practitioners/
27. exp Family Medicine/
28. exp Family Physicians/
29. exp Treatment Barriers/
30. exp health disparities/
31. exp health care utilization/
32. 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31
33. (((primary or ambulatory) adj3 care) or ((family or general) adj3 (medicine or practice* or physician* or doctor* or practitioner* or provider*)) or outpatient* or ((communit* or comprehensiv*) adj3 (health* or care))).mp.
34. (rural* or underserv* or frontier* or (geograph* adj3 (isolat* or remot*))).mp.
35. 33 or 34
36. 32 or 35
37. 18 and 36
38. limit 18 to systematic reviews
39. exp treatment outcomes/or exp treatment effectiveness evaluation/
40. 18 and 39
41. exp "Death and Dying"/
42. exp mortality rate/
43. 41 or 42
44. 18 and 43
45. exp "costs and cost analysis"/
46. 18 and 45

- 47. exp Sociocultural Factors/
- 48. exp socioeconomic status/
- 49. 47 or 48
- 50. 18 and 49
- 51. exp quality of life/
- 52. 18 and 51
- 53. exp health behavior/
- 54. 18 and 53
- 55. exp attitudes/
- 56. 18 and 55
- 57. 38 or 40 or 44 or 46 or 50 or 52 or 54 or 56
- 58. 37 or 57

CINAHL

S1 (MH "Substance Use Disorders+")

S2 (MH "Narcotics+")

S3 S1 AND S2

S4 "methadone"

S5 "buprenorphine"

S6 "naltrexone"

S7 suboxone

S8 S4 OR S5 OR S6 OR S7

S9 S1 AND S8

S10 (medicat* n3 assist* n3 (treat* or therap* or regimen* or interven* or program*))

S11 ((opiate* or opioid* or narcotic*) n2 (substitut* or replac* or maint*) n2 (treatment* or therap* or regimen* or program* or interven*))

S12 S10 OR S11

S13 S1 AND S12

S14 S3 OR S9 OR S13

S15 S3 OR S9 OR S13

S16 (MH "Primary Health Care")

S17 (MH "Community Health Services+")

S18 (MH "Outpatients") OR (MH "Outpatient Service") OR (MH "Ambulatory Care Facilities+")

S19 (MH "Family Practice")

S20 (MH "Physicians, Family")

S21 (MH "Health Services Accessibility+")

S22 S16 OR S17 OR S18 OR S19 OR S20 OR S21

S23 (((primary or ambulatory) n3 care) or ((family or general) n3 (medicine or practice* or physician* or doctor* or practitioner* or provider*)) or outpatient* or ((communit* or comprehensiv*) n3 (health* or care)))

S24 (rural* or underserv* or frontier* or (geograph* n3 (isolat* or remot*)))

S25 S23 OR S24

S26 S22 OR S25

S27 S15 AND S26

S28 (MH "Systematic Review")

S29 (MH "Meta Analysis")

S30 (MH "Practice Guidelines") OR (MH "Guideline Adherence")

S31 (MH "Randomized Controlled Trials")

S32 (MH "Epidemiological Research+")

S33 (MH "Prospective Studies+")

S34 S28 OR S29 OR S30 OR S31 OR S32 OR S33

S35 S15 AND S34

S36 (MH "Outcomes (Health Care)+")

S37 (MH "Vital Statistics+")

S38 (MH "Evaluation Research+")

S39 (MH "Costs and Cost Analysis+")

S40 (MH "Socioeconomic Factors+")

S41 (MH "Cultural Values")

S42 (MH "Quality of Life+")

S43 (MH "Quality-Adjusted Life Years")

S44 (MH "Health Behavior+")

S45 (MH "Attitude+")

S46 S36 OR S37 OR S38 OR S42 OR S43

S47 S15 AND S46

S48 S15 AND S46

S49 S15 AND S34

S50 s48 NOT s49

SocINDEX

S1 (MH "Substance Use Disorders+")

S2 (MH "Narcotics+")

S3 S1 AND S2

S4 "methadone"

S5 "buprenorphine"

S6 "naltrexone"

S7 suboxone

S8 S4 OR S5 OR S6 OR S7

S9 S1 AND S8

S10 (medicat* n3 assist* n3 (treat* or therap* or regimen* or interven* or program*))

S11 ((opiate* or opioid* or narcotic*) n2 (substitut* or replac* or maint*) n2 (treatment* or therap* or regimen* or program* or interven*))

S12 S10 OR S11

S13 S9 OR S12

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Table 1

Key Informants (n=11)

Stakeholder	Representative
Clinicians with experience treating OUD in primary care (n=5)	<ul style="list-style-type: none"> • Internal medicine/addictionologist • Family medicine/addictionologist • Addiction psychiatrist • Psychologist • Registered nurse
Policy Experts in OUD treatment implementation (n=4)	<ul style="list-style-type: none"> • Health Resources and Services Administration HIV/AIDS Bureau • Substance Abuse and Mental Health Services Administration • National Institute on Drug Abuse • National Association of State Alcohol and Drug Abuse Directors
Professional Societies (n=1)	<ul style="list-style-type: none"> • American Association of Opioid Treatment Providers
Patient Perspective (n=1)	<ul style="list-style-type: none"> • Patient in recovery who also directs an opioid treatment program

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Table 2

Sources for MAT models of care

Model	Published Literature	Grey Literature
Practice-Based Models		
1) Office-based Opioid Treatment (OBOT)	Fiellin, 2002 (16) * Fiellin, 2006 (15) * Fiellin, 2008 (14)	–
2) Buprenorphine-HIV Evaluation and Support (BHIVES) Collaborative Model	Altice, 2011 (17) Chaudhry, 2011 (56) Cheever, 2011 (57) Egan, 2011 (58) Fiellin, 2011 (18) Finkelstein, 2011 (59) Friedland, 2011 (60) Korthuis, 2011 (19) Korthuis, 2011 (20) Lucas, 2010 (21) * Lum, 2011 (61) Schackman, 2011 (62) Sullivan, 2006 (23) * Sullivan, 2011 (63) Vergara-Rodriguez, 2011 (64) Weiss, 2011 (25) Weiss, 2011 (26)	https://www.careacttarget.org/library/bee-hive-buprenorphine-program-tools (24) http://www.slideshare.net/SarahCookRaymond/buprenorphine-therapy-in-the-hiv-pruma (22)
3) One Stop Shop Model	–	http://www.lifespringhealthsystems.org/about-us/locations/ (33)
4) Integrated Prenatal Care and MAT (Expert suggestion)	–	–
System-Based Models		
5) Hub and Spoke Model (Vermont)	–	https://www.pcpc.org/initiative/vermont-hub-and-spokes-health-homes (39) http://www.healthvermont.gov/adap/documents/HUB http://www.leg.state.vt.us/reports/2014ExternalReports/299315.pdf (38) http://www.achp.org/wp-content/uploads/Vermont-Health-Homes-for-Opiate-Addiction-September-2013.pdf (41)
6) Medicaid Home Model For Those With Opioid Use Disorder	–	https://www.medicaid.gov/Federal-Policy-Guidance/Downloads/CIB-07-11-2014.pdf (36) https://www.medicaid.gov/state-resource-center/medicaid-state-technical-assistance/health-homes-technical-assistance/downloads
7) Project Extension for Community Healthcare Outcomes (ECHO) (New Mexico)	Komaromy, 2016 (42)	http://echo.unm.edu/wp-content/uploads/2014/10/Opioid-Abuse-and-Addiction-Management-Protocol.pdf (43) http://www.aafp.org/news/chapter-of-the-month/20140930nmafap-chapspot.html (44)
8) Collaborative Opioid Prescribing (Co-OP) Model (Maryland)	Stoller, 2015 (46)	http://www.atforum.com/pdf/CoOPTalkforONDOP_SAMHSAug2015Stoller.pdf (45)
9) Massachusetts Nurse Case Manager Model	Alford, 2007 (65) Alford, 2011 (47) LaBelle, 2016 (48)	http://www.mass.gov/eohhs/gov/departments/dph/stop-addiction/get-help-types-of-treatment.html (66)
10) Emergency Department	D'Onofrio, 2015 (49) *	–

Model	Published Literature	Grey Literature
(ED) Initiation of OBOT		
11) Inpatient Initiation of MAT	Liebschutz, 2014 (50) *	–
12) Southern Oregon Model	–	http://www.oregonpainguidance.org/ (67)

Abbreviation: MAT = medication-assisted treatment.

* Randomized controlled trial evaluating the model of care

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Table 3
 Overview of MAT models of care for OUD in primary care (including rural or other underserved settings)

Model	Summary	Pharmacological Component	Education/Outreach Component	Coordination/Integration of Care Component	Psychosocial Component	Other Component(s)
Practice-Based Models						
1) Office-based Opioid Treatment (OBOT)	Glue person (typically nurse) with expertise in buprenorphine working in collaboration with primary care clinician	Primarily buprenorphine/naloxone	Not a major component	Glue person (typically nurse) instrumental for coordinating and integrating care, including primary care and mental health	Physician counseling monthly; some psychological services provided on-site by glue person or other staff. Other psychosocial services vary, including integrated CBT, Motivational Enhancement Therapy; some psychosocial services offsite	
2) Buprenorphine-HIV Evaluation and Support (BHIVES) Collaborative Model	Chronic care model for providing buprenorphine/naloxone in HIV primary care clinic setting	Buprenorphine/naloxone	Patient and provider educational material available online	Treatment for OUD and primary care, including HIV care integrated in same setting. Clinical coordinator "glue person" coordinates care; works in conjunction with primary care provider. Provision of HIV care may be by the primary care provider or another provider working with the primary care provider	On-site psychological services variable, including individual and group counseling	Coordination with OTP for patients switching to or from methadone
3) One Stop Shop Model	Integrated mental health clinic to provide "one-stop" shopping including management of HIV/HCV infection and plans for MAT in progress	Primarily naltrexone	Education to increase number of waived physicians	Treatment for OUD, mental health, and primary care (including HIV/HCV care) provided in same setting. Peer navigators and social workers provide coordination with	Centered in mental health clinic that provides comprehensive psychological services; psychiatrist once a week	Syringe exchange and other services also available

Model	Summary	Pharmacological Component	Education/Outreach Component	Coordination/Integration of Care Component	Psychosocial Component	Other Component(s)
4) Integrated Prenatal Care and MAT	Model providing prenatal care to pregnant women who are treated with buprenorphine	Buprenorphine	Not a major component	primary care providers Primary care clinic provides MAT, as well as prenatal and postpartum care; care continued in office-based setting for 1 year after birth. In some programs women can work with doulas	Services provided on-site or via partnering OTP	
System-Based Models						
5) Hub and Spoke Model (Vermont)	Centralized intake and initial management (buprenorphine induction) at "hub" and then patients connected to "spokes" in community for ongoing management	Primarily buprenorphine/naloxone	Outreach to prescribers in the community to increase number of buprenorphine-waivered physicians.	Coordination/integration between hub and spoke as well as within each primary care site "spoke." Registered nurse clinician case manager, and/or care connector (peer, behavioral health specialist) for coordination/integration of care at spokes.	Embedded in spoke sites, including social workers, counseling, and community health teams.	Hubs provides consultative services and available to manage clinically complex patients, support tapering off MAT, or prescribe methadone, if needed
6) Medicaid Home Model For Those With Opioid Use Disorder	A flexible model that provides MAT in combination with behavioral health therapies and integrated with primary care.	Primarily buprenorphine/naloxone	Provider and community education emphasized to increase uptake and decrease stigma	Required component, but mechanism of coordination varies	Six core psychosocial services are required: comprehensive care management, care coordination, health promotion, comprehensive transitional care/follow-up, individual and family support and referral to community and social support services.	Some telehealth services offered
7) Project Extension for Community Healthcare Outcomes (ECHO) (New Mexico)	Model of care for linking primary care clinics in rural areas with a university health system, emphasizing	Primarily buprenorphine/naloxone	Mentored buprenorphine prescribing for providers, including Internet-based, audiovisual network for provider education. Free buprenorphine training provided several times a year. ECHO staff provide patient	NP/PA performs initial evaluation and screening educate patient and refer to collaborating physician for treatment. NP/PA	Counseling and behavioral therapies offered from all ECHO team members including CHWs, although CHWs and NPs provide education/support, psychosocial support including 12 step	Refer any patients with high or moderate risk scores for opioid use to NP for further assessment and/or referral to OTP

Model	Summary	Pharmacological Component	Education/Outreach Component	Coordination/Integration of Care Component	Psychosocial Component	Other Component(s)
8) Collaborative Opioid Prescribing (Co-OP) Model (Maryland)	nurse practitioner or physician assistant screening and MAT (physician prescribing) combined with counseling and behavioral therapies.	Buprenorphine/naloxone	education one-to-one or in group setting.	performs monitoring treatment and followup appointments including labs, urine testing, monitoring, patient education and support and other coordination (e.g., vaccinations)	programs, crisis counseling, referrals, and relapse-prevention plans.	In Baltimore, supports to facilitate access to health coverage through Medicaid and to coordinate care through HealthCare Access Maryland
9) Massachusetts Nurse Case Manager Model	Links opioid treatment programs with office-based buprenorphine providers; initial intake, induction, and stabilization performed at OTP then shifted to primary care clinic	Primarily buprenorphine/naloxone, with integration of extended-release naltrexone in last two years	Outreach performed by counselors to community physicians	Initial assessment, psychosocial treatment, and expert consultation initiated in drug treatment program and patients transitioned to primary care in federally qualified health center following stabilization	Provided concurrently via OTP, including ongoing counseling and monitoring	Patients who require higher level of care can be expedited into an OTP, assistance with transfers of care, day support programs
	A primary-care based model that teams nurse care managers with primary care physicians; nurse care managers generally perform initial screening, intake, education, observed/ supports induction, followup, maintenance, stabilization, and medical management with the physician and team.		A training program exists to get more physicians, especially residents, and also faculty on board. Department of Public Health trains staff on best practices. Nurse care managers receive 8 hours of training in MAT, shadowing in model MAT site, site visits, email and phone support, case review, quarterly trainings, and addiction list server.	Nurse care managers (RN or FNP) manage 100 to 125 patients alongside primary care clinicians, with assistance from a medical assistant. Alternatively, care partners (usually Master's level individuals) who assist the primary care staff with screening, brief intervention, and referral to treatment.	Psychological services are integrated on-site or nearby	

Model	Summary	Pharmacological Component	Education/Outreach Component	Coordination/Integration of Care Component	Psychosocial Component	Other Component(s)
10) Emergency Department (ED) Initiation of OBOT	Model involving ED identification of OUD; buprenorphine/naloxone induction initiated in ED; coordination with OBOT, nurse with expertise in buprenorphine working in collaboration with primary care clinician	Buprenorphine/naloxone	Not a major component	OUD identified in ED and patients started on buprenorphine and connected to ongoing OBOT provided by physicians and nurses for 10 weeks, then transferred to office-based ongoing maintenance treatment or detoxification.	“Medical management” counseling visits with physician and nurse	
11) Inpatient Initiation of MAT	Model involving identification of OUD in the hospital and connecting patients to office-based MAT and primary care	Buprenorphine/naloxone, naltrexone	Not a major component	MAT started by multidisciplinary addiction consult service during medical hospitalization and connected with primary care. Treatment continued in primary care; some programs have buprenorphine “bridge” clinic prior to transition to primary care.	Provided at primary care site	
12) Southern Oregon Model	A local and informal model for delivery of MAT in a rural primary care network	Almost exclusively buprenorphine/naloxone	A group of local stakeholders from many perspectives who prescribe opioids (Oregon Pain Guidance) meets regularly to develop guidance and provide education.	Relatively limited support for coordination/integration of care	On-site licensed clinical social worker with experience in treating patients for pain and addiction, not necessarily in MAT.	Access to OTPs for complex patients not formally integrated.

Abbreviations: CBT = cognitive behavioral therapy; CHW = community health worker; DPH = Department of Public Health; ED = emergency department; FNP = family nurse practitioner; HCV = hepatitis C virus; MAT = medication-assisted treatment; NP = nurse practitioner; OTP = opioid treatment program; OUD = opioid use disorder; PA = physician assistant; RN=registered nurse.