



## Review article

# Patient outcomes associated with primary care behavioral health services: A systematic review



Kyle Possemato<sup>a,b,\*</sup>, Emily M. Johnson<sup>a</sup>, Gregory P. Beehler<sup>a,c</sup>, Robyn L. Shepardson<sup>a,b</sup>, Paul King<sup>a,d</sup>, Christina L. Vair<sup>e</sup>, Jennifer S. Funderburk<sup>a,b,f</sup>, Stephen A. Maisto<sup>a,b</sup>, Laura O. Wray<sup>a,g</sup>

<sup>a</sup> VA Center for Integrated Healthcare, New York/New Jersey VA Healthcare System, United States

<sup>b</sup> Department of Psychology, Syracuse University, Syracuse, NY, United States

<sup>c</sup> Community Health and Health Behavior, University at Buffalo, Buffalo, NY, United States

<sup>d</sup> Department of Counseling, School, and Educational Psychology, University at Buffalo, Buffalo, NY, United States

<sup>e</sup> Salisbury VA Health Care System, Salisbury, NC, United States

<sup>f</sup> Department of Psychiatry, University of Rochester, Rochester, NY, United States

<sup>g</sup> Division of Geriatrics/Palliative Care, Jacobs School of Medicine, University at Buffalo, Buffalo, NY, United States

## ARTICLE INFO

## Keywords:

Primary care behavioral health  
Access  
Utilization  
Functioning  
Satisfaction

## ABSTRACT

**Objective:** This systematic review focused on Primary Care Behavioral Health (PCBH) services delivered under normal clinic conditions that included the patient outcomes of: 1) access/utilization of behavioral health services, 2) health status, and 3) satisfaction.

**Method:** Following PRISMA guidelines, comprehensive database searches and rigorous coding procedures rendered 36 articles meeting inclusion criteria. The principle summary measures of odd ratios or Cohen's *d* effect sizes were reported.

**Results:** Due to significant limitations in the methodological rigor of reviewed studies, robust findings only emerged for healthcare utilization: PCBH is associated with shorter wait-times for treatment, higher likelihood of engaging in care, and attending a greater number of visits. Several small, uncontrolled studies report emerging evidence that functioning, depression, and anxiety improve overtime. There was no evidence of greater improvement in patient health status when PCBH was compared to other active treatments. The limited available evidence supports that patient satisfaction with PCBH services is high.

**Conclusions:** The implementation of PCBH services is ahead of the science supporting the usefulness of these services. Patient outcomes for PCBH are weaker than outcomes for Collaborative Care. More rigorous investigations of patient outcomes associated with PCBH are needed to allow for optimization of services.

Primary Care Behavioral Health (PCBH) describes a platform of care delivery in which behavioral health services are integrated within the primary care environment [1]. Various terms are used to describe PCBH in the literature, including Co-located Collaborative Care and the Behavioral Health Consultant model. PCBH is just one of many models for integrating behavioral health services in primary care settings [2]. Similar to other integrated care models, such as Collaborative Care, PCBH services are intended to be population-based, collaborative, accessible, time-limited, and responsive to the needs of patients [3]. Ideally, PCBH services are both measurement-based and evidence-based [4]. Goals of PCBH include improving detection of behavioral health problems, increasing access to and engagement in appropriate care, improving quality and coordination of care through collaboration between behavioral health and medical providers, and decreasing patient perceptions

of mental health stigma [5].

PCBH is a unique model of care. PCBH differs from traditional mental health services, as treatment typically involves lower appointment frequency and duration compared to specialty care [6]. The prototypic course of treatment ranges from 1 to 6, 30-min appointments, spaced every 2–4 weeks. PCBH also differs from other integrated care models. Compared to co-located services, PCBH strives to fully integrate mental health professionals into the primary care team to provide consultation to team members on management of behavioral health concerns and provide brief assessment and intervention directly to patients. PCBH differs from Collaborative Care, also referred to as Care Management and Disease Management in the literature, in several important ways [7]. PCBH entails licensed independent mental health providers, such as psychologists or clinical social workers, delivering

\* Corresponding author at: Syracuse VAMC, 800 Irving Ave-116C, Syracuse, NY 13210, United States.  
E-mail address: [kyle.possemato@va.gov](mailto:kyle.possemato@va.gov) (K. Possemato).

brief psychotherapy for a wide range of behavioral health concerns. In contrast, Collaborative Care often involves nurse care managers providing psychosocial support around the use of medications for specific behavioral health concerns such as depression or alcohol use disorder [8,9]. The support provided in Collaborative Care is protocol-driven and guided by algorithms for stepping care up or down based on patient progress over time. In contrast, brief psychotherapy in PCBH is typically guided by the individual clinician's judgment.

PCBH is widely implemented across various public healthcare systems including the Veterans Health Administration (VHA), the Department of Defense (DoD), Federally Qualified Health Centers (FQHC), and private health care systems. However, there is relatively little research on whether patients benefit from receiving PCBH services. This stands in stark contrast to the well-established evidence-base for Collaborative Care. Meta-analyses have concluded that Collaborative Care improves patient-reported symptoms [10,11]. Much less is known about possible patient benefits or outcomes associated with PCBH, including improved access to services, increased engagement in healthcare, changes in mental health symptoms (e.g., depression, anxiety), and changes in behavioral concerns (e.g., pain, substance use). With the growing interest in improving the patient experience in healthcare, patient satisfaction is increasingly being recognized as an important patient outcome as well.

A recent narrative review concluded that existing research indicates good patient satisfaction and decreases in psychological symptoms for patients who receive PCBH; however, as the authors noted, the methodological rigor of the cited research was poor, with most studies lacking comparison groups [12]. This review did not specifically investigate patient access as an outcome. Immediate or timely access to behavioral health services may in fact be the most valued aspect of PCBH. Also, the goal of this recent narrative review was to summarize the state of the field to improve the quality of research efforts [12]. In contrast, our review focuses on a detailed reporting and analysis of the outcomes reported in the literature. A systematic review that includes protocol-based data extraction and synthesis consistent with PRISMA guidelines can result in a more evidence-based summary and interpretation of study outcomes compared to a narrative review [13].

Patient outcomes are distinct from system-level outcomes (e.g. institutional cost saving, staff turnover), process variables (e.g., more collaboration between providers), and implementation outcomes (e.g. adoption and reach of services), which are also important indicators of the success of PCBH. The limited available evidence on system-level outcomes indicates that facilities with a higher proportion of patients receiving PCBH have reductions in the amount of traditional mental health services that are used [14]. However, these changes in utilization patterns are not associated with cost differences [15]. A recent narrative review of PCBH process outcomes found that provider fidelity to the PCBH model was suboptimal, with concerns related to low use of standardized assessment measures, inadequate communication among professional staff, and a focus on traditional mental health concerns (e.g., depression) to the exclusion of health behavior problems [16]. Low provider adherence to the PCBH model may affect patient-level outcomes. For instance, if providers do not adhere to the brief treatment format, then access for subsequent patients may be negatively affected.

Despite the known challenges in implementing PCBH with high fidelity, PCBH services are standard practice across various public and private healthcare systems [12]. Because PCBH services are so widely delivered, the lack of a systematic review on how patients benefit from PCBH is a major gap in the field. Information on which patient outcomes are commonly evaluated and the effect of PCBH services on those outcomes can guide existing PCBH systems in optimization efforts. Also, a systematic review of the state of the evidence on patient outcomes in PCBH can be used by healthcare systems that do not provide PCBH to assess whether to invest in this new service. This review is timely in that federal funding has recently become available to states to redesign care systems to optimize patient clinical and population-focused outcomes.

Many states are using this funding to integrate behavioral and medical services for Medicaid recipients [17]. This article systematically reviews patient outcomes research associated with PCBH services as typically delivered under normal clinic procedures. Our primary aim was to draw conclusions regarding the benefits patients experience from PCBH services. We also sought to evaluate the quality of the research reviewed, identify under-researched areas, and provide recommendations for future investigation. Based on the rationale and goals for PCBH, three categories of patient outcomes were identified for this systematic review: 1) patient access to and utilization of healthcare services; 2) patient health status as measured by change in symptoms, functioning, and behaviors; and 3) patient satisfaction with care.

## 1. Methods

Four inclusion criteria were developed for this systematic review. 1) Only empirical, published, peer-reviewed works in English focusing on adult populations were included. 2) Articles needed to report on PCBH services that met the following definition: services were provided within primary care by licensed independent mental health providers, called Behavioral Health Consultants (BHCs) in the PCBH model, with the goal of ongoing communication and collaboration between the BHC and other primary care members. Therefore, research on a variety of PCBH models was included, such as PRISM-E [18], the Air Force PCBH model [19], and VHA's White River Junction [20] and SLI<sup>2</sup>CE [21] models. Articles focused on the delivery of services by non-independent providers (i.e., Collaborative Care) were excluded. Brief treatment sessions (e.g., 30 min or less) are a hallmark of high fidelity PCBH treatment; however, we did not require this for inclusion because many articles did not report on session length and others reported variable session length. Also, this variation is commonly observed in treatment as usual PCBH services [16]. 3) Articles needed to report at least one of the three selected PCBH patient outcomes (access/utilization, health status, or satisfaction). 4) Articles needed to focus on PCBH delivery under normal clinical conditions. Articles focused on special administration of particular interventions for research purposes (e.g., experimental protocols delivered only to patients with PTSD symptoms) were excluded, because such articles do not contribute to the primary research question of whether patients typically benefit from services offered under normal clinic procedures. Because randomized clinical trials (RCTs) on this topic are rare, there were no exclusions based on the presence of comparison groups, type of research design, or sample size.

The search strategy was an iterative process starting with a review of personal libraries of relevant works to identify key terms, authors, and topics. Next, PubMed and PsycINFO were searched from 1990 to present combining permutations of “primary care” with “mental health” and/or “behavioral health” as the basic search. A variety of terms were then added to identify patient outcome articles (e.g., “symptom change”, “utilization”, “satisfaction”). Searches were supplemented with reviews of selected reference lists. The first searches were performed in December 2015, and searches were repeated in June 2017 to find new, relevant publications.

Literature searches resulted in a total of 17,892 articles. The first or second author reviewed the title and/or abstracts of each article for the four inclusion criteria described above and narrowed the pool to 74 potential articles for inclusion. The first author plus one additional author independently reviewed the full text of the 74 articles and applied the inclusion four criteria to select the final pool of articles (n = 36; see PRISMA flow diagram in supplemental materials for additional information). Next, authors coded each of the selected articles for study setting, patient population, study design, results, and key strengths and limitations in a formatted spreadsheet. The first author reviewed this coded information, checked the primary sources for inconsistencies in coding, and generated a list of study strengths and limitations (including risk for bias). Another author then re-coded all

**Table 1**  
Description of studies investigating access, healthcare utilization, health status, and satisfaction associated with primary care behavioral health.

| Citation                   | Setting                        | Patient population   | Groups (design)   | Primary results   | Effect size (95% CI)  | Key limitations  | Key strengths          |
|----------------------------|--------------------------------|--|---|---|---|------------------|------------------------|
| Angantyr et al., 2015 [30] | Community (Sweden)             | 54 PCBH patients   | Prospective evaluation (pre, post, 3 month follow-up)                         | Time to first PCBH visit: 48% seen within 3 days, 52% seen within 7–30 days   | N/A <sup>1</sup>  | a, b, c, i       | d, e, i, l             |
| Ayalon et al., 2007 [31]   | Community                      | 183 elderly PC patients  | PCBH vs. enhanced specialty referral (RCT)                                    | 1. Attended ≥ 1 MH visit: Black patients were more likely compared to comparison (78% vs. 22%); no difference for White patients (67% vs. 47%).<br>2. Time to first visit: shorter time to first visit in PCBH than in comparison for both Black (M = 31.06 [28.66] vs. 62.45 [43.57]) and White patients (M = 22.18 [33.88] vs. 63.46 [32.31]).          | 1. OR = 0.21 VS (0.05–0.96)<br>2. OR = 0.31 VS (0.11–0.89)                                      | d, e             | b, c, g,               |
| Bartels et al., 2004 [18]  | Community and VHA              | 2022 PC patients ≥ 65 years old with a MH disorder or at-risk drinking | PCBH vs. enhanced specialty referral (RCT)                                    | 1. % engaged in care: 71% in PCBH vs. 49% in comparison<br>2. Total # visits: 3.04 (3.7) in PCBH vs. 1.91(3.6) in comparison.   | 1. OR = 2.57 S (2.14–3.08)<br>2. d = 0.31 S (0.22–0.40)   | e, h             | a, b, c, d, g, j, k, m |
| Begley et al., 2008 [35]   | Community (safety-net clinics) | 260 PC patients with MH diagnoses                                      | Pre PCBH implementation vs. post  | Total of MH visits increased from 1.7 pre-implementation to 2.5 post-implementation.  | N/A <sup>2</sup>  | c, h             | b, d, e, f, i, k, l, m |
| Bohnert et al., 2013 [37]  | VHA                            | 9046 PC patients with new MH diagnosis                                 | PC patients who received same-day PCBH vs. those who did not (non-randomized) | 1. Same-day PCBH encounter: 7%<br>2. Had a subsequent MH visit within 90 days: 7.4% in PCBH vs. 48% in comparison   | 1. N/A <sup>1</sup><br>2. OR = 2.05 S (1.66–2.54)   | c                | a, b, d, e, g, j       |
| Bohnert et al., 2016 [22]  | VHA                            | 5966 PC patients who screened positive for PTSD                        | PCBH pts. vs. PC only patients (non-randomized)                               | SMH treatment initiation: same-day PCBH encounter was associated with greater odds of initiating any PTSD treatment within 12 weeks of diagnosis, compared with PC only.  | OR = 3.39 M (2.63–4.37)   | c                | a, b, d, e, g, j       |
| Brawer et al., 2011 [23]   | VHA                            | 398 OEF/OIF Veterans with PTSD Clinic consult                          | PCBH vs. direct referrals to PTSD Clinic (non-randomized)                     | 1. Consult completion rate: higher for PCBH-originated consults (71%) compared to PCP consults (56%).<br>2. Consult cancellation due to administrative reasons: less often for PCBH-originated consults (5%) compared to consults from rest of hospital (21%).  | 1. OR = 1.90 S (1.16–3.13)<br>2. OR = 0.09 VS (0.04–0.20)                                       | c, d             | a, b, e, i, j          |
| Brawer et al., 2010 [21]   | VHA                            | 3531 PCBH patients   | Post PCBH implementation vs. pre  | 1. Access to MH provider increased by 391% following implementation<br>2. SMH consult completion rate higher among PCBH patients (66%) than general medical center patients (47%).<br>3. 37% reduction in SMH consults from PCPs<br>4. Overall 15% increase in # of antidepressant medications prescribed by PCPs.  | 1. N/A <sup>1</sup><br>2. OR = 2.16 S (1.64–2.85)<br>3. N/A <sup>1</sup><br>4. N/A <sup>1</sup> | c, d, h          | a, b, e, i, j, k       |
| Bridges et al., 2014 [36]  | Community (FQHC)               | 793 PCBH patients  | Retrospective chart review  | 1. Attendance at follow-up PCBH visit: no difference between Latinos (28%) and non-Latinos (35%).<br>2. Total # of visits: no significant difference between Latinos (M = 1.57 [1.01]) and non-Latinos (M = 1.48 [0.99]).<br>Total # of outpatient medical visits: more visits after first PCBH visit (M = 8.4 [6.8]) compared to before (M = 6.8 [6.3]). | 1. OR = 0.08 N (–0.40–1.56)<br>2. d = 0.09 N (–0.06–0.23)<br>d = 0.24 S (0.06–0.43)             | c, f             | a, b, e, g, i, k, l    |
| Cigrang et al., 2006 [38]  | DOD (Air Force)                | 234 PCBH patients  | 6 months prior to first PCBH visit vs. 6 months after first visit             | Total # of PC visits: decrease in # of PC medical visits following initial PCBH visit (M = 4.7 [4.0]) compared to before (M = 6.3 [4.4]).   | d = 0.38 M (0.00–0.76)  | a, c, f, h, k    | b, d, e, f, l          |
| Davis et al., 2008 [39]    | Community (8 clinics in UK)    | 58 PCBH patients   | 12 months before initial PCBH visit vs. 12 months after visit                 | SMH referral success rate: higher when referral made by PCBH provider (87%) compared to PCP only (70%).   | OR = 3.33 L (0.1,49–7.46)   | b, c, d, f, h, k | a, e, f, i, j          |
| Davis et al., 2016 [24]    | VHA                            | 967 PCBH patients  | Retrospective chart review  | English speakers were 75% less likely to follow through on a warm-handoff compared to a prescribed referral; no significant difference observed for Spanish speakers.   | OR = 0.27 VS (0.09–0.74)  | c, d             | a, b, e, g, j, k,      |
| Horevitz et al., 2015 [48] | Community (FQHC)               | 431 PCBH patients referred for depression                              | Warm hand offs vs. prescribed referrals (chart review)                        | Access within 2 weeks: more PCBH patients (51%) saw a MH provider within two weeks compared to comparison (15%).  | OR = 5.46 VL (4.43–6.74)  | e                | a, b, c, d, i, k, l    |
| Krahn et al., 2006 [34]    | Community and VHA              | 1998 older PC patients with MH diagnoses                               | PCBH vs. enhanced specialty referral (RCT)                                    |   |   |                  |                        |

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**Table 1** (continued)

| Patient access and utilization of healthcare |                                    |   |   |   |  |                               |
|--|------------------------------------|---|---|---|--|-------------------------------|
| Citation                                     | Setting                            | Patient population  | Groups (design)   | Primary results   | Effect size (95% CI)   | Key limitations Key strengths |
| Landis et al., 2013 [41]                     | Community (family medicine clinic) | 552 depressed patients  | Compared co-located BH, PCBH, PCBH + CM (models implemented consecutively over 5 years) | Receipt of ≥ 3 visits within 12 weeks: 44% for co-located BH, 55% for PCBH and 61% for PCBH + CM  | co-located BH vs. PCBH<br>OR = 1.60 S (1.10–2.31),<br>PCBH vs. PCBH+CM<br>OR = 0.79 VS (0.38–1.64)<br>OR = 0.59 VS (0.42–0.83)               | c, d, h, a, b, e, i, j, l     |
| Lanoye et al., 2016 [40]                     | Community (safety-net clinic)      | 1440 PC patients  | Compared PCBH patients to medical treatment only patients (non-randomized)              | Preventable inpatient hospitalizations decreased more among PCBH patients (5.8%) compared to control patients (2.2%). No group differences in ED or PC visits.  | OR = 0.59 VS (0.42–0.83)   | c, d, a, b, e, f, g, i, k, m  |
| Pfeiffer et al., 2011 [29]                   | VHA                                | 49,957 PC patients with new visits to specialty MH                                | Compared facilities with and without PCBH programs (non-randomized)                     | 1. Initiation of SMH treatment: no difference between facilities with PCBH (5.6%) and those without (5.8%).<br>2. Total # of SMH visits: no difference between facilities with PCBH (7.0) and those without (6.3).  | 1. OR = 0.09 N (-0.33–2.6)<br>2. d = 0.17 N (-0.07–0.41)   | c, h, a, b, d, e, g           |
| Pomerantz et al., 2008 [25]                  | VHA                                | 486 patients referred for PCBH  | Compared outcomes before and after PCBH re-design                                       | 1. PCBH no show rate: pre = 38%, post = 0%<br>2. Time to first PCBH visit: pre = 33 days, post = 19 min<br>3. SMH referral rate: pre = 100%, post = 17%<br>4. SMH no-show rate: pre = 40%, post = 12%   | 1. OR = infinity VL (no SD given)<br>3. OR = infinity VL<br>4. OR = 4.39 M (2.77–6.93)   | c, d, h, a, b, d, i, j, l     |
| Sadock et al., 2014 [32]                     | Community (safety-net clinic)      | 452 patients referred to PCBH   | Program evaluation  | 1. Same day PCBH visit: 35%<br>2. Time to first PCBH visit: 21 days (SD = 44)<br>3. Returned for ≥ 1 visit: 42%<br>4. Total # of PCBH visits: 2 (SD = 2)  | N/A <sup>1</sup>   | b, c, d, f, a, e, i, k, l     |
| Szymanski et al., 2012 [26]                  | VHA                                | 36,263 PC patients who screened positive for depression and were not in treatment | Compared patients who received same day PCBH to same day PC only (non-randomized)       | 1. Initiated psychotherapy within 12wks: PC 19%, PCBH 67%<br>2. initiated antidepressants within 12wks: PC 27%, PCBH 49%<br>3. initiated any treatment within 12 wks: PC 35%, PCBH 79%.   | 1. OR = 8.16 L (6.54–10.17)<br>2. OR: 2.33 S (2.10–2.58)<br>3. OR = 6.60 L (5.32–8.18)<br>2. N/A <sup>1</sup><br>3. OR = 3.05 M (1.79, 5.21) | c, a, b, d, e, g              |
| Tsan et al., 2012 [33]                       | VHA                                | 181 new OEF/OIF veterans who received PCBH  | Retrospective chart review  | 1. % of patients who received SMH treatment subsequent to the initial PCBH visit: 60% within 1 month, 74% within 3 months<br>2. Median time subsequent to SMH visit: 14 days<br>3. Patients who had PCBH visit within their first year of VHA care were 3 × more likely to receive SMH care 3 years later than patients who did not receive PCBH in their first year. | 1. N/A <sup>1</sup><br>2. N/A <sup>1</sup><br>3. OR = 3.05 M (1.79, 5.21)  | b, c, d, e, f, g, i           |
| Watts et al. 2007 [27]                       | VHA                                | 670 PC patients who screened positive for depression                              | Comparison of clinics with and without PCBH services                                    | 1. Receipt of depression treatment: PCBH 52%, traditional referral: 38%<br>2. Receipt of optimal depression treatment: PCBH 11%, traditional referral 1%<br>3. Seen in SMH clinic: PCBH 36%, traditional referral 9%  | 1. OR = 2.01 S (1.30–3.10)<br>2. OR = 19.11 L (2.55–143.44)<br>3. OR = 9.02 L (0.433–18.78)  | c, a, b, d, e, i              |
| Wray et al. 2012 [28]                        | VHA                                | 92,190 patients with ≥ 1 SMH visit and 1 PC visit in previous 12 months           | Comparison of clinics with and without PCBH services                                    | Retention in SMH treatment: patients with a PCBH visit within the 3 months prior to an initial SMH visit were 1.37 times more likely to have a second SMH visit than patients with no PCBH visits.  | OR = 1.37 VS (1.30–1.44)   | c, h, a, b, d, e, g, i        |

Patient health status

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Table 1 (continued)

| Citation                   | Setting                        | Patient population                       | Design  | Primary results  | Effect size (95% CI)   | Key limitations        | Key strengths          |
|----------------------------|--------------------------------|--|---|--|--|------------------------|------------------------|
| Angantyr et al., 2015 [30] | Community (Sweden)             | 54 PCBH patients                         | Prospective evaluation (pre, post, 3 month follow-up)                   | <ol style="list-style-type: none"> <li>1. Significant improvements in anxiety (HADS) from pre (10.41 [5.12]) to follow-up (6.51 [4.78]).</li> <li>2. Significant improvements in depression (HADS) from pre (7.04 [4.63]) to follow-up (4.87 [4.70]).</li> <li>3. Significant improvements in functioning (DUKE) from pre (65.90 [15.32]) to post (70.18 [14.63]).</li> </ol>  | <ol style="list-style-type: none"> <li>1. d = 0.79 L (0.39–1.17)</li> <li>2. d = 0.47 M (0.08–0.84)</li> <li>3. d = 0.29 S (–0.66–0.10)</li> </ol> | a, b, c                | d, e, g, h, i          |
| Begley et al., 2008 [35]   | Community (safety-net clinics) | 416 PCBH patients                        | Prospective evaluation (pre and follow-up- 30 days after initial visit) | <ol style="list-style-type: none"> <li>1. Significant improvements in depression (BASIS) from pre (2.50 [0.93]) to follow-up (2.17 [0.98]).</li> <li>2. Significant improvements in emotional lability (BASIS) from pre (2.37 [0.97]) to follow-up (2.09 [1.08]).</li> <li>3. Significant improvements in alcohol/drug use (BASIS) from pre (0.43 [0.73]) to post (0.36 [0.65]).</li> </ol>  | <ol style="list-style-type: none"> <li>1. d = 0.35 S (0.21–0.48)</li> <li>2. d = 0.27 S (0.14–0.41)</li> <li>3. d = 0.10 S (–0.03–0.24)</li> </ol> | c, f, g, h, j          | a, d, e, h, i, k       |
| Bridges et al., 2014 [36]  | Community (FQHC)               | 129 PCBH patients                        | Retrospective chart review  | 1. Clinically significant improve in psych sx and functioning (ACORN).   | 1. d ≈ 0.50 M [2]  | b, c, f, h, j          | d, e, h, i, k          |
| Bridges et al., 2015 [49]  | Community (FQHC)               | 117 patient who attended ≥3 PCBH visits  | Retrospective chart review  | <ol style="list-style-type: none"> <li>2. No differences between Latinos and non-Latinos.</li> <li>1. Functioning (GAF) improved from visit 1 (54.44 [7.87]) to visit 3 (62.68 [9.54]) for any PCBH intervention received.</li> <li>2. Functioning (GAF) improved from visit 1 (58.93 [6.85]) to visit 3 (67.86 [10.84]) for 33 patients receiving Behavioral Activation.</li> <li>3. Functioning (GAF) improved from visit 1 (52.27 [7.86]) to visit 3 (60.45 [8.20]) for 12 patients receiving Exposure</li> </ol> | <ol style="list-style-type: none"> <li>1. d = 0.48 M (0.22–0.74)</li> <li>2. d = 0.98 L (0.46–1.48)</li> <li>3. d = 1.02 L (0.14–1.83)</li> </ol>  | b, c, f, j             | d, e, g, h, i, j, k, l |
| Bryan et al., 2009 [19]    | DOD (Air Force)                | 113 PCBH patients                        | Program evaluation  | <ol style="list-style-type: none"> <li>1. Patients (n = 80) who attended 2 visits improved on global MH (BHM-20) from visit 1 (2.74 [0.64]) to visit 2 (3.06 [0.64]).</li> <li>2. Patients (n = 25) who attended 3 visits improved on global MH (BHM-20) from visit 1 (2.51 [0.60]) to visit 3 (2.94 [0.60]).</li> <li>3. Patients (n = 8) who attended 4 visits did not improve on global MH (BHM-20) from visit 1 (2.21 [0.95]) to visit 4 (2.54 [0.71]).</li> </ol>   | <ol style="list-style-type: none"> <li>1. d = 0.50 M (0.15–0.81)</li> <li>2. d = 0.72 L (0.13–1.28)</li> <li>3. d = 0.39 M (–0.62–1.36)</li> </ol> | a, b, c, d, f, h, j, k | e, h, i, j             |
| Bryan et al., 2012a [42]   | DOD (Air Force)                | 497 patients who attended ≥2 PCBH visits | Program evaluation  | Suicidal ideation (BHM-20) decreases over the course of PCBH apps.   | N/A <sup>2</sup>   | b, c, f, j             | a, d, e, g, h, i, l    |
| Bryan et al., 2012b [50]   | DOD (Air Force)                | 495 patients who attended ≥2 PCBH visits | Program evaluation  | <ol style="list-style-type: none"> <li>1. 41% of patients reliably improved on psychological symptoms and functioning (BHM-20)</li> <li>2. Patients with moderate- severe psychological symptoms (70%) were more likely to show reliable improvement than patients with mild illness (57%).</li> </ol>   | <ol style="list-style-type: none"> <li>1. N/A<sup>1</sup></li> <li>2. OR = 2.28 S (1.41–3.69)</li> </ol>   | b, c, f, j, j          | a, d, e, g, h, i, j    |
| Cigrang et al., 2006 [38]  | DOD (Air Force)                | 114 PCBH patients                        | Program evaluation  | <ol style="list-style-type: none"> <li>1. Patients (n = 59) who attended 2 visits declined on MH distress (OQ-45) from visit 1 (65.0 [24.7]) to visit 2 (55.5 [24.5]).</li> <li>2. Patients (n = 29) who attended 3 visits declined on MH distress (OQ-45) from visit 1 (61.9 [24.8]) to visit 3 (49.3 [21.9]).</li> <li>3. Patients (n = 26) who attended &gt; 4 visits declined on MH distress (OQ-45) from visit 1 (77.7 [17.7]) to visit 4 (60.8 [16.2]).</li> </ol>   | <ol style="list-style-type: none"> <li>1. d = 0.39 M (0.02–0.75)</li> <li>2. d = .47 M (–0.05–0.95)</li> <li>3. d = 1.00 L (0.41–1.56)</li> </ol>  | a, b, c, f, h, j, k, k | d, e, f, h, i, j, l    |
| Corso et al., 2009 [51]    | DOD (Air Force)                | 19 PCBH patients with PTSD               | Program evaluation  | <ol style="list-style-type: none"> <li>1. PTSD severity (PCL-M) decreased from first (48.0 [9.2]) to last (40.4 [8.9]) visit.</li> <li>2. Global MH (BHM-20) did not decrease from first (2.6 [0.67]) to last (2.8 [0.55]) visit.</li> </ol>   | <ol style="list-style-type: none"> <li>1. d = 0.84 L (0.16–1.48)</li> <li>2. d = .33 S (–0.96–0.32)</li> </ol>                                     | a, b, c, d, f, h, j, k | e, h, i, j             |

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**Table 1** (continued)

| Patient health status          |                                    |  |   |  |  |                        |                           |
|--------------------------------|------------------------------------|--|---|--|--|------------------------|---------------------------|
| Citation                       | Setting                            | Patient population   | Design  | Primary results  | Effect size (95% CI)   | Key limitations        | Key strengths             |
| Davis et al., 2008 [39]        | Community                          | 54 PC patients who received PCBH                               | Prospective evaluation (pre, post, 30 month follow-up)                            | 1. More patients were below the clinical cut-off for MH symptoms (CORE-OM) at post (71%) than pre (31%).<br>2. More patients were below the clinical cut-off for MH symptoms (CORE-OM) at follow-up (69%) than pre (31%).<br>3. Depression (PHQ-9) decreased from initial visit (15.5) to 3 month follow-up (7.55).<br>4. Quality of life (SF-12) increased from initial visit to 3 month follow-up. | 1. $d = 0.99$ L (0.61–1.39)<br>2. $d = 1.11$ VL (0.72–1.51)<br>N/A <sup>2</sup>  | a, b, c, f, h, k       | d, e, f, h, l             |
| Kolbasovsky et al., 2005 [52]  | Community (4 medical centers)      | 76 depressed PCBH patients who completed 3 months of treatment | Prospective evaluation (pre, 3 month follow-up)                                   | 1. Depression (PHQ-9) decreased from initial visit (15.5) to 3 month follow-up (7.55).   | N/A <sup>2</sup>   | a, b, c, d, h          | d, e, h, i                |
| Krahn et al., 2006 [34]        | Community and VHA                  | 1220 older PC patients with depression                         | PCBH vs. enhanced specialty referral (RCT)  | 1. Depression (CES-D) decreased in PCBH (24.8 [10.3] to 18.2 [11.8]) and control (25.1 [10.5] to 17.3 [11.1]) from baseline to 6 month follow-up. Groups did not significantly differ.<br>2. Mental health functioning (MOS-36) improved in PCBH (38 [11.4] to 42.8 [12.3]) and control (37.4 [11.2] to 42.5 [11.9]) from baseline to 6 month follow-up. Groups did not significantly differ.        | 1. PCBH = $d = 0.60$ M (0.48–0.71)<br>Control = $d = 0.70$ L (0.61–0.84)<br>2. PCBH = $d = 0.40$ M (0.29–0.52)<br>Control = $d = 0.44$ M (0.33–0.55)                         | e, h                   | a, b, c, d, f, g, h, i, k |
| Landis et al., 2013 [41]       | Community (family medicine clinic) | 552 depressed patients   | Compared co-located BH, PCBH, PCBH + CM, (implemented consecutively over 5 years) | 1. Depression (PHQ-9) decreased in co-located BH (16.4 [4.3] to 10.1 [7.4]), PCBH (15.4 [4.2] to 9.2 [6.3]), and PCBH + CM (15.3 [3.9] to 8.4 [6.9]) from baseline to 6-month follow-up.<br>2. Outcomes for models of care did not significantly differ from each other.   | 1. co-located BH $d = 1.22$ VL (0.88–1.55)<br>PCBH = $d = 1.27$ VL (1.06–1.48)<br>PCBH+CM $d = 1.33$ VL (0.69–1.93)<br>Initial session to follow up $d = 0.58$ M (0.24–0.57) | a, c, d, f, h, k       | b, e, h, i, j, l          |
| Ray-Sannerud et al., 2012 [53] | DOD (Air Force)                    | 70 PCBH patients who returned follow-up surveys                | Prospective evaluation (pre, 1.5 to 3 year follow-up)                             | Global MH scores (BHM-20) improved from initial (2.58 [0.74]) to last session (3.01 [0.98]) and were maintained 1.5 to 3 years post-treatment (3.01 [0.75]).   | 1. $d = 0.26$ S (–0.06–0.59)<br>2. $d = 0.37$ M (0.03–0.69)  | a, b, c, d, f, h, j    | e, f, h, i                |
| Sadock et al., 2014 [32]       | Community (safety-net clinic)      | 73 patients who attended ≥3 PCBH visits                        | Program evaluation  | 1. Depression (PHQ-9) decreased from initial visit (14.33 [6.73]) to visit 3 to 5 (12.41 [7.74]).<br>2. Anxiety (GAD-7) decreased from initial visit (12.60 [5.54]) to visit 3 to 5 (10.43 [6.32]).  | 1. $d = 0.26$ S (–0.06–0.59)<br>2. $d = 0.37$ M (0.03–0.69)  | a, b, c, d, f, g, h, j | e, h, i, k                |
| Patient satisfaction           |                                    |  |   |  |  |                        |                           |
| Citation                       | Setting                            | Patient population   | Design  | Primary results (measurement) <sup>1</sup>   | Key limitations  | Key strengths          |                           |
| Angantyr et al., 2015 [30]     | Community (Sweden)                 | 54 PCBH patients   | Program evaluation  | Moderately high satisfaction (CSQ)   | a, b, c  | d, e, g, h, i          |                           |
| Bridges et al., 2014 [36]      | Community (FQHC)                   | 173 PCBH patients  | Retrospective chart review  | High satisfaction and therapeutic alliance (ACORN)   | b, c, f  | d, e, g, i, k, l       |                           |
| Corso et al., 2012 [54]        | DOD (Air Force)                    | 541 PCBH patients  | Program evaluation  | High therapeutic alliance (TBS) following first PCBH appt, therapeutic alliance unrelated to prospective clinical change.  | b, c, g  | a, e, g, h, i, l       |                           |
| Ede et al., 2015 [55]          | Community (1 of 3 sites is FQHC)   | 51 PCBH patients   | Program evaluation  | High satisfaction (MCFS) including comfort in setting and learning skills needed to deal with problems. Preference to receive mental health services in primary care setting.  | a, b, c, f, i  | d, e, i, k             |                           |
| Funderburk et al., 2010 [56]   | VHA                                | 140 PCBH patients  | Program evaluation  | Moderately high satisfaction (MCFS) including time spent with provider, help received from provider, overall quality of care and overall satisfaction.   | a, b, f, i   | d, e, i                |                           |
|                                | University Health Center           |  | Program evaluation  |  | a, b, c, d, f, i   | e, i                   |                           |

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**Table 1** (continued)

| Patient satisfaction         |                  | Primary results (measurement) <sup>1</sup> |                    |  |                 | Key limitations        | Key strengths |
|------------------------------|------------------|--|--------------------|--|-----------------|------------------------|---------------|
| Citation                     | Setting          | Patient population                         | Design             | Primary results (measurement) <sup>1</sup>   | Key limitations | Key strengths          |               |
| Funderburk et al., 2012 [57] |                  | 52 patients who ≥ 1 PCBH visit             |                    | Moderately high satisfaction (MCFS) with PCBH and reported a willingness to meet again with providers.   |                 |                        |               |
| Pomerantz et al., 2008 [25]  | VHA              | 987 new PCBH referrals                     | Program evaluation | 99% of patients reported good-excellent satisfaction (MCFS)  | b, c, d, i      | a, e, i                |               |
| Villalobos et al., 2016 [58] | Community (FQHC) | 458 Spanish speaking PCBH patients         | Program evaluation | High satisfaction and therapeutic alliance (ACORN) for PCBH patients with bilingual providers and those who used interpreters. Qualitative data indicate a preference for bilingual providers. | c               | a, b, d, e, g, h, i, k |               |

ACORN = A Collaborative Outcomes Research Network questionnaire; BASIS = Behavior and Symptom Identification Scale; BH = Behavioral Health; BHM-20 = Behavioral Health Measure-20; CI = Confidence Interval; CM = Care Management; CSQ = Client Satisfaction Questionnaire; DOD = Department of Defense; DUKE = Duke Health Profile; FQHC = Federally Qualified Health Center; GAD-7 = Generalized Anxiety Disorder-7; GAF = Global Assessment of Functioning; HADS = Hospital Anxiety and Depression Scale; MCFS = Measure Created for Study; MH = Mental health; MOS-36 = Medical Outcomes Study-36; MH = Mental health; OEF/OIF = Operation Enduring Freedom/Operation Iraqi Freedom; OQ-45 = Outcome Questionnaire-45; OR = Odds ratio; PC = Primary Care; PCBH = Primary Care Behavioral Health; PCL = PTSD Checklist; PCP = Primary Care Provider; PHQ-9 = Patient Health Questionnaire-9; PTSD = Post-traumatic Stress Disorder; RCT = Randomized Clinical Trial; SF-12 = Short-form Survey-12; SMH = Specialty Mental Health; TBS = Therapeutic Bond Scales; VHA = Veterans Health Administration.

Interpretation of Cohen's d: Negligible (N) = confidence interval includes 0, Small (S) = 0.10–0.35, Medium (M) = 0.36–0.65, Large (L) = 0.66–1.05, Very Large (VL) = 1.06–1.33.

Interpretation of Odds Ratios (OR) [59]: Negligible (N) = confidence interval includes 0, Very Small (VS) < 1.50 when CI does not include 0, Small (S) = 1.50–2.57, Medium (M) = 2.58–5.00, Large (L) ≥ 5.01.

Key Limitations: a. Small sample size (N < 100) in at least one of the main analyses, b. No control/comparison group, c. No randomization, d. Limited generalizability due to only 1 clinic included in study, e. Limited generalizability due to restrictive exclusion criteria, f. Response bias due to outcome data only for subset of patients, g. No follow-up or limited duration (< 30 days) of follow-up, h. Failure to measure and/or control for at least some important covariates (e.g., baseline predictors of outcome, # of PCBH visits), i. Use of non-validated measure(s), j. Follow-up interval varied from patient to patient, k. Analyses were under-powered.

Key Strengths: a. Large sample size (N ≥ 300), b. Included control/comparison group, c. Randomization to groups, d. National dataset or data from multiple sites, e. Good external validity due to no/limited exclusion criteria, f. Includes long-term follow-up data (≥ 6 months), g. Analyses controlled for at least some important covariates, h. Used validated measure(s), i. Detailed description of PCBH services, j. Reported on fidelity to PCBH model and/or investigated key components of PCBH model (e.g., specific behavioral interventions, # of PCBH visits, PCBH model comparisons, warm hand-offs), k. Focus on under-served group(s), l. Investigated relationships between multiple PCBH outcomes (e.g., utilization, health status and satisfaction), m. Reports cost data.

<sup>1</sup> Data are descriptive so effect sizes could not be calculated.

<sup>2</sup> Inadequate information provided to calculate effect size.

included articles based on the standardized lists of strengths and limitations. The principal summary measures of odds ratios (ORs) or Cohen's *d* effect sizes were used across all studies to allow interpretation of results. This review was registered at PROSPERO, registration #CRD42016036989.

## 2. Results

### 2.1. Patient access to and utilization of healthcare

Twenty-three studies reported patient access and utilization of healthcare outcomes. Table 1 displays key characteristics of the study designs and outcomes. Eleven studies analyzed data from community clinics, eleven studies focused on VHA utilization, and one study examined Air Force PCBH utilization. Sample size varied greatly from 54 to 92,190 patients. Ten studies included < 500 patients, six studies included 501–2000 patients, four studies included 2001–10,000 patients and three studied include over 10,000 patients. As shown in Table 1, the most common limitations among these studies was lack of randomization ( $n = 20$ ), failure to measure and/or control for important covariates (e.g., baseline predictors of outcome), ( $n = 10$ ) and limited generalizability due to only one clinic included in the study ( $n = 9$ ). The most common methodological strengths were the inclusion of control/comparison groups ( $n = 19$ ), good external validity due to no/limited exclusion criteria ( $n = 19$ ), sample sizes of at least 300 participants ( $n = 17$ ), and detailed descriptions of the PCBH services that were delivered ( $n = 15$ ).

A wide variety of health care utilization outcomes were reported, with most studies reporting multiple outcomes. Nine studies examined initiation rates of specialty mental health care following receipt of PCBH. Eight of these studies found that receipt of PCBH services was associated with increased odds of initiating specialty care (ORs 1.37–9.02) [21–28]. The average OR of all studies (including the study that did not find significant results [29]) was 3.76 ( $SD = 3.02$ ), which falls in the “medium” effect size range. Six studies measured time to first mental health visit [25,30–34]. Two of these studies were RCTs and found that PCBH led to significantly less wait time than enhanced specialty referral (ORs .31 [31] and 5.46 [34]). The other four studies only provided descriptive statistics on wait time; mean wait times ranged from 19 min [25] to 21 days [32]. Four studies reported on number of PCBH visits, ranging from 1.5 to 3.04 mean visits [18,32,35,36]. One of these studies was a RCT and found that PCBH patients had significantly more visits than enhanced specialty care referral patients ( $d = 0.31$ , small effect [18]).

Several studies evaluated other health care utilization outcomes. Four studies included likelihood of attending at least two PCBH visits [32,33,36,37]; 30–74% attended a second visit, with a small effect in the single RCT comparing PCBH to enhanced specialty referral (OR 2.05 [37]). Three studies evaluated likelihood of having any PCBH visits [18,25,31]; 67%–100% attended any PCBH visits, with a small effect in the single RCT comparing PCBH to enhanced specialty referral (OR 2.57 [18]). Three studies reported number of *medical* appointments following PCBH [38–40], with two studies reporting decreased utilization (very small to medium effect), and one study reporting increased utilization (small effect). Two studies evaluated increases in psychiatric medication initiation related to PCBH (15% increase [21] and, 49% increase, OR 2.33, small effect [26]). The following outcomes were reported in one study each: percent of patients who received 3 visits in 12 months (55% [41]), mental health care retention (patients who had a PCBH visit within their first year of VHA care were three times more likely to be receiving mental health care two years later than patients who did not receive PCBH in their first year [33]), and receiving guideline concordant depression treatment (PCBH patients were 19 times more likely to receive concordant treatment [27]).

### 2.2. Patient health status

Fifteen studies were identified that included the measurement of changes in patient health status, with the most common design measuring change from the initial PCBH session to a later or final session (Table 1). Studies' samples were predominately ( $n = 9$ ) from community primary care clinics, including FQHCs, safety net clinics, and one study recruited from both community clinics and a VHA clinic. Six studies reported on PCBH delivered in Air Force family medicine clinics. Sample size varied from 19 to 1220 patients. Six studies included < 100 patients, eight studies included 300–600 patients and one study included 1220 patients. As shown in Table 1, the most common limitations among these studies was no randomization ( $n = 14$ ), lack of a control/comparison group ( $n = 12$ ), and response bias due to collecting outcome data for only a subset of patients ( $n = 12$ ). The most common strengths of these studies were use of validated outcome measures ( $n = 15$ ), good external validity due to no/limited exclusion criteria ( $n = 14$ ), and detailed descriptions of the PCBH services delivered ( $n = 14$ ).

Within this domain, changes in general psychological distress or functioning were most commonly measured and reported ( $n = 11$ ). In these studies, seven different instruments were used, with the Behavioral Health Measure-20 being the most common ( $n = 5$ ). Changes in depressive symptoms were reported in six studies using four different depression inventories, with the Patient Health Questionnaire-9 used most frequently. Changes in anxiety symptoms were reported in two studies and measured by the Hospital Anxiety and Depression Scale and Generalized Anxiety Disorder-7. Other outcomes reported in one study each were alcohol/drug use, emotional lability, suicidal ideation, and PTSD.

Fourteen of the fifteen studies reported statistically significant improvements in patient health status in at least one area. The other study [42] reported declines in suicidal ideation over time, but no statistical tests were calculated and not enough information was reported to calculate an effect size. Only one of the 15 studies, an RCT, had a comparison group that did not receive PCBH. Krahn et al. [34] compared 1220 older primary care patients with depression who were randomized to PCBH or enhanced specialty referral. Patients in both conditions experienced statistically significant pre-post changes in depression and mental health functioning, but condition by time effects were not observed, indicating that both platforms of care worked equally well. Thirty-one effect sizes were reported/calculated across the 15 studies, ranging from small to very large with the mode being a medium effect size. No trends were found regarding higher or lower effect sizes for specific outcomes (e.g., depression vs. anxiety).

### 2.3. Patient satisfaction

Eight studies reported on patient satisfaction or therapeutic alliance (Table 1). Patient samples across studies were diverse and included individuals who received PCBH services in VHA, DOD, FQHCs, and a college health center, and two studies compared Latino to non-Latino patients. Sample sizes ranged from 52 to 987 patients. No studies included a comparison group (Table 1). Half of the studies used previously validated measures (i.e., A Collaborative Outcomes Research Network Questionnaire, Client Satisfaction Questionnaire, Therapeutic Bond Scales), while the other studies created their own satisfaction questions. Similar to other domains in this review, common strengths were detailed descriptions of the PCBH services delivered ( $n = 8$ ), and good external validity due to no/limited exclusion criteria ( $n = 7$ ). All studies found that patient satisfaction or therapeutic alliance was good to excellent.

## 3. Discussion

This review demonstrates convincing evidence that PCBH is



associated with increased access to, and utilization of, behavioral health services in both primary care and specialty mental healthcare settings despite some methodological limitations in the literature. Numerous uncontrolled studies report a wide variety of positive utilization outcomes associated with PCBH and typically demonstrate a small to medium effect. Results from the three RCTs reviewed show that PCBH is associated with shorter wait-times for treatment, and higher likelihood of both engaging in care and attending a greater number of visits in PCBH compared to enhanced specialty referral [18,31,34]. However, conclusions about the effects of PCBH on health care utilization should be tempered due to concerns regarding the overall methodological rigor. Frequent limitations in the studies that present healthcare utilization outcomes include non-randomized designs, failure to control for relevant covariates, and relying on data from only one clinic. Nonetheless, the strengths of the literature are numerous and include the use of comparison conditions, large sample sizes, and limited inclusion/exclusion criteria that maximize external validity.

Studies evaluating patient health outcomes demonstrate consistent positive results, but the strength of the findings is attenuated by significant methodological concerns. Overall there is emerging evidence that global functioning, depression, and anxiety improve over time in patients who received PCBH. Importantly, however, when compared to active controls, PCBH demonstrated non-superior outcomes. Common methodological concerns include lack of randomization, lack of control groups, and small sample sizes. Many studies relied on post-session measures for follow-up data, and this led to inconsistent between-participant follow-up intervals and response bias (i.e., only patients who returned for follow-up sessions provided follow-up data). Strengths of the studies included use of validated measures, good external validity, and informative descriptions of the PCBH services provided.

The limited evidence base for changes in patient health status related to PCBH stands in stark contrast to the robust evidence for changes in patients status (especially depression, anxiety, and quality of life) associated with Collaborative Care [8,10,43]. Many more studies have investigated patient health status in Collaborative Care than in PCBH [7]. For instance, one RCT focused on patient health status was included in this review, compared to 79 Collaborative Care RCTs included in a 2012 meta-analysis [10]. However, PCBH is implemented more widely than Collaborative Care [44]. For example, national VHA primary care mental health integration program data from 2016 indicated that 87% (n = 342) of facilities have PCBH providers located in primary care while only 49% (n = 194) have collaborative care services located in primary care [45]. This demonstrates the tremendous gap between the research evidence and clinical care. Investigating factors (e.g., provider preferences, system costs, ease of implementation) related to why PCBH is implemented more widely than Collaborative Care is needed.

The limited available evidence indicates that patients tend to be satisfied with PCBH services and to establish good therapeutic alliance with their BHCs. Although all studies demonstrated positive results, scientific quality was poor with no studies using randomized controlled designs and only half of the studies using validated measures. It is important to note that RCTs of Collaborative Care have found that patients are more satisfied with Collaborative Care than usual care comparisons [10]. Future PCBH research should include comparison groups and evaluate satisfaction and therapeutic alliance with validated measures. In traditional mental health settings patient satisfaction and therapeutic alliance are known to be reliable predictors of psychotherapy outcome [46]. However, research has yet to investigate if these associations also exist within the brief treatment model of PCBH.

PCBH is potentially best conceptualized as a platform of care delivery rather than a specific intervention [20]. It is therefore not surprising that access and utilization outcomes represented the bulk of the studies in this review with the strongest evidence. It may be unreasonable to expect large overall improvements in patient health status given the diverse nature of the presenting concerns and treatment

delivered in PCBH. Evidence for improvement might best be captured through RCTs evaluating specific brief interventions delivered within PCBH against active control conditions. While some research evaluating changes in common mental health symptoms following PCBH services exists, much less attention has been paid to changes in functional outcomes and health behaviors. Functional improvement and behavior change in the areas of sleep, pain management, and medication adherence are common foci within PCBH and future research should address outcomes in these domains.

Taken as a whole, the PCBH literature provides a basis for cautious optimism for improved patient outcomes. Future research should seek to understand the active ingredients of PCBH and identify modifiable factors that can improve patient utilization and health status. For example, are there specific components of PCBH, beyond same-day access, which improve patient outcomes (e.g., use of evidence-based brief treatment, communication between PCPs and BHCs)? Collaborative Care has more clearly defined the drivers of improved patient outcomes (e.g., team care and measurement-guided care), and PCBH would benefit from a similar approach. Current PCBH research also does not inform the field as to whether patient characteristics, including presenting concerns/diagnosis, predict who may or may not benefit from PCBH services.

The greatest strength and limitation of this systematic review is the wide variability among the studies reviewed. This breadth allowed us to capture a wide range of patient outcomes. This provides a unique contribution to the literature highlighting findings from individual studies side-by-side. However, this is also a significant limitation of the review. The diverse nature of the studies included made it impossible to use an existing, standardized approach to evaluate the methodological quality of the studies. The known challenges with fidelity to the PCBH model [16] also limit what can be concluded from this review. Review results reflect PCBH as it is typically delivered, not results from high-fidelity PCBH treatment. The diversity in how PCBH is delivered is a reflection of the model itself: PCBH is not protocol-driven, accommodates a wide range of conditions, and relies largely on BHCs' clinical expertise [7]. Heterogeneous services of this type are difficult to rigorously evaluate. The diversity inherent in the PCBH model helps to explain why it is studied less frequently than Collaborative Care, and subsequently, why the PCBH evidence base is much weaker than that of Collaborative Care.

The overall quality of the studies included in the review is low due to the predominance of pre/post-treatment, repeated-measures, and program evaluation study designs. Although these designs provide valuable information to the field, it can be difficult to distinguish patient outcomes that change as a result of the treatment from numerous other factors (e.g., spontaneous remission), especially among disorders that are known to be episodic (e.g., depression). Studies with control groups are better designed to account for these factors, but there are relatively few studies utilizing control groups measuring PCBH services compared to treatment as usual [47]. This is largely because patients cannot ethically be randomized to receive something less than what is already provided as treatment as usual. Alternative models of care (e.g., direct referral to specialty mental health or Collaborative Care) or sites that have not yet implemented PCBH could serve as potential control groups in future research.

This review finds that PCBH services improve access to and utilization of mental healthcare along with positive preliminary evidence of improved patient health outcomes and satisfaction. However, the great variability in methodological rigor of the reviewed studies minimizes the meaningful conclusions that can be drawn. Nonetheless, this review is able to inform the field on what patient outcomes we can be confident are improving following PCBH services (e.g., access to care), what outcomes need further study (e.g., changes in patient functioning), and that the PCBH evidence-base for improving patient health status is currently much less robust than that of Collaborative Care. In conclusion, the implementation of PCBH services is ahead of the science

supporting the usefulness of these services [47]. However, the popularity and diverse dissemination of PCBH should serve as motivators to administrators, funding bodies, and researchers to conduct more rigorous investigations of patient outcomes associated with PCBH to allow for refinement and optimization of services.

### Acknowledgments/Contributors

Staff at the Center for Integrated Healthcare New York/New Jersey VA Healthcare System. Funders

This material is based upon work supported by the Department of Veterans Affairs, Veterans Health Administration, Center for Integrated Healthcare. Prior presentations

None.

### Conflicts of interest

The authors have no conflicts of interest.

### Disclaimer

The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.genhosppsych.2018.04.002>.

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