

# Patient–Provider Language Concordance and Health Outcomes: A Systematic Review, Evidence Map, and Research Agenda

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## Abstract

Although patient–provider language concordance has the potential to reduce health disparities for people with limited English proficiency, no previous work has synthesized this literature. Our systematic review sought to describe the characteristics of studies examining relationships between language concordance and health outcomes, summarize the nature of observed associations, and propose an evidence map and research agenda. A comprehensive search of published articles identified 38 quantitative studies for inclusion. Most studies were cross-sectional, conducted in primary care, concentrated in Western states, and focused on Spanish speakers and physician providers. Results were split between supporting a positive association versus no association of language concordance with patient behaviors, provider behaviors, interpersonal processes of care, and clinical outcomes. Several methodological limitations were identified. Based on these results, we developed an evidence map, identified knowledge gaps, and proposed a research agenda. There is a particular need for quasi-experimental longitudinal studies with well-characterized samples.

**Keywords:** health disparities, language, physician/patient communication, immigrants, systematic review

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1 The health and well-being of immigrants and their families living in the U.S. is  
2 paramount to the health of the overall U.S. population (Derose et al., 2009). The estimated 43  
3 million immigrants living in the U.S. constitute ~13% of the general population (Lopez &  
4 Radford, 2017) and an estimated 38 million people in the U.S. are children of at least one  
5 immigrant parent. Yet, unequal access to adequate medical care continues to jeopardize the  
6 health of immigrants and their children (Pew Research Center, 2013; Lopez & Radford, 2017;  
7 Derose et al. 2009).

8 Language is an important consideration in this context. Approximately half (20.4 million)  
9 of the immigrant population has limited English proficiency (LEP), defined as any person aged 5  
10 years or older who reports speaking a language other than English at home and reports speaking  
11 English less than 'very well' as classified by the U.S. Census Bureau (Zong & Batalova, 2015b).  
12 An additional 4.7 million people with LEP are U.S.-born, mainly to immigrant parents. In total,  
13 people with LEP represent 8.5% of the U.S. population (Zong & Batalova, 2015b). People with  
14 LEP experience poorer health outcomes (Eamranond, Legedza, et al., 2009; Divi et al., 2007;  
15 Gandhi et al., 2000) and a 2006 review (Jacobs et al., 2006) concluded that language barriers in  
16 healthcare are associated with poor health outcomes.

17 One proposed factor for improving health for individuals with LEP is language  
18 concordance in healthcare. Language concordance occurs when patients and providers  
19 communicate in a shared language, whereas language discordance occurs when patients and  
20 providers cannot communicate in a shared language. Healthcare providers will oftentimes rely on  
21 interpreters to communicate with patients with LEP. Several systematic reviews have examined  
22 the efficacy of this practice. For example, Flores (2005) examined the impact of medical  
23 interpreter services on a number of health-related outcomes, including communication quality,

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3 24 patient satisfaction with care, and use of health services. He highlighted two main findings. First,  
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5 25 both trained (professional) interpreters and bilingual providers can have a beneficial effect on  
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8 26 quality of care. Second, relying on untrained interpreters (e.g., family members or non-physician  
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10 27 staff) is associated with inferior care. A 2007 review detected a similar pattern of results.  
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12 28 Specifically, relying on trained interpreters is associated with better clinical care compared to  
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14 29 relying on untrained interpreters, and further, relying on professional interpreters appears to raise  
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16 30 the quality of clinical care for patients with LEP to approach or equal that for patients that speak  
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18 31 English (Karlner, Jacobs, Chen, & Mutha, 2007). In 2010, a more focused examination on the  
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20 32 impact of patient language proficiency and interpreter service use on the quality of psychiatric  
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22 33 care found that, consistent with the broader literature on medical interpreting, relying on trained  
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24 34 interpreters was associated with higher quality psychiatric care, while the use of untrained  
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26 35 interpreters was associated with more interpreter errors (Bauer & Alegría, 2010). Finally, another  
27  
28 36 focused look at the impact of interpreters on palliative care quality to patients with cancer also  
29  
30 37 found evidence of the beneficial effect of trained interpreters on palliative care quality, with the  
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32 38 authors warning specifically against the common practice of using family members as untrained  
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34 39 interpreters (Silva et al., 2016). Overall, the evidence base supporting the use of professionally  
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36 40 trained medical interpreters is well established, and many healthcare organizations continue to  
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38 41 rely on medical interpreters. Nonetheless, a growing evidence body suggests that patients need to  
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40 42 communicate directly with a language-concordant provider to establish rapport, be satisfied with  
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42 43 their experience, and receive better medical care (Green et al., 2005b; Ngo-Metzger et al., 2007b;  
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44 44 Lee et al., 2002a). Therefore, in this review, we define language concordance as occurring when  
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46 45 patients are able to directly communicate with their providers in the patient's preferred language.  
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The specific objectives of the present review are to: (1) describe the characteristics of quantitative studies examining relationships between patient-provider language concordance and health outcomes; (2) summarize the nature of observed associations; and (3) propose an evidence map and future research agenda to address key knowledge gaps and methodological limitations.

#### NEW CONTRIBUTION

While prior reviews have established the effectiveness of professionally trained interpreter services, no previous work has synthesized the literature linking language concordance (when patients are able to directly communicate with their providers in the patient's preferred language) to health outcomes. This review will be the first to critically evaluate the state of the literature on language concordance and health outcomes, identify key methodological limitations and knowledge gaps and propose specific strategies to address them, and provide an organizing map of the available evidence. These contributions are important because, while the population that has LEP continues to grow (Pew Research Center, 2013), the healthcare industry continues to struggle to provide a linguistically diverse workforce to serve them (Grumbach & Mendoza, 2008; Sanchez, Nevarez, Schink, & Hayes-Bautista, 2015). Policies that support effective practices are informed by rigorous, clinically relevant research. Therefore, the overall aim of this review is to advance the state of the literature by distilling what is known about language concordance-health outcome relationships and improving the quality of future research in this area.

#### CONCEPTUAL FRAMEWORK

The conceptual framework in Figure 1 guides this review. We adapted the framework proposed by Kilbourne and colleagues (Kilbourne, Switzer, Hyman, Crowley-Matoka, & Fine, 2006) for understanding the determinants of health disparities to focus on the healthcare context

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2 69 – specifically, patient behaviors, provider behaviors, and interpersonal processes of care. We  
3 70 added the clinical outcomes domain, given that healthcare organizations often utilize clinical  
4 71 outcomes as indicators of quality of care. Focusing on the healthcare context is important, as  
5 72 patients with LEP have more negative experiences with healthcare, which may play a role in  
10 73 their poorer health outcomes. For instance, patients with LEP are less likely to engage in health-  
116 74 promoting behaviors, such as keeping follow-up appointments or following self-management  
12 75 recommendations (Karter et al., 2000; Sarver & Baker, 2000), possibly due to misunderstanding  
137 76 instructions or poor rapport (Karliner et al., 2012; Ferguson & Candib, 2002). Despite best  
14 77 intentions, healthcare providers may contribute to the problem by unwittingly delivering  
158 78 inadequate or inappropriate care. Compared to English-proficient patients, patients with LEP  
169 79 receive fewer preventive services and health-promoting recommendations, such as diet and  
17 80 exercise counseling (Jacobs et al., 2005; Woloshin et al., 1997; Lopez-Quintero, Berry, &  
18 81 Neumark, 2010). Finally, interpersonal processes of care between patients with LEP and their  
19 82 providers may be less effective. For instance, patients with LEP are less likely to understand  
20 83 their diagnosis, treatment, or discharge instructions (Karliner et al., 2012; Wilson et al., 2005;  
21 84 Morales et al., 1999). Furthermore, providers who cannot speak their patients' language are more  
22 85 likely to omit important questions or information in their discussions with their patients and are  
23 86 more likely to misdiagnose their patients (Flores et al., 2003).

## METHODS

Search strategy and selection process

24 89 We conducted a comprehensive literature search using the following terms, conjoined by  
25 90 an OR statement: language concordance, language concordant, language discordance, language  
26 91 discordant, linguistic concordance, linguistic concordant, linguistic discordance, linguistic

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3 92 discordant. This search was conducted in the following databases: Medline, ScienceDirect, Web  
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5 93 of Science, PsycInfo, EMBASE, and CINAHL. We also backreferenced selected articles for  
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8 94 relevant studies and reviewed titles and abstracts of studies citing selected articles in Web of  
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10 95 Science. Titles and abstracts of identified journal articles were reviewed against inclusion and  
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12 96 exclusion criteria (below) to determine initial eligibility for inclusion. The full texts of studies  
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15 97 that appeared to be eligible for inclusion were obtained and reviewed to determine final status. If,  
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17 98 after screening the title and abstract, there remained uncertainty about eligibility, full texts were  
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19 99 reviewed. For each excluded study, the reason for exclusion was recorded.

#### 100 Inclusion and exclusion criteria

101         Studies were included if they: (1) were quantitative studies published in peer-reviewed  
102 journals, (2) compared patient-provider language concordance to language discordance, (3)  
103 assessed at least one health-related outcome, and (4) reported the association between language  
104 concordance and at least one health outcome. For the purposes of this review, patient-provider  
105 language concordance was defined as occurring when patients and providers can directly  
106 communicate in the patient's preferred language ('language-concordant'), whereas language  
107 discordance was defined as occurring when patients and providers cannot directly communicate  
108 in the patient's preferred language ('language-discordant'). Studies were excluded if they: (1)  
109 were not in English, (2) were not conducted on a U.S. sample, (3) did not include a sample with  
110 LEP, (4) were exclusively qualitative in nature or not a research article (e.g., commentary), and  
111 (5) achieved language concordance through interpreter use only. Non-U.S. samples were  
112 excluded because this review seeks to examine the evidence for language concordance as a  
113 potential mechanism underlying differences in health outcomes for U.S. immigrants. The U.S. is  
114 unique among other industrialized countries in that residents lack access to universal healthcare,

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3 115 and the downstream consequences of disparate health insurance coverage rates and prohibitively  
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5 116 high healthcare costs likely disproportionately burden immigrants and their families.

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8 117 Data extraction procedure

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10 118 The first author used a standard data form to extract study descriptives (study  
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12 119 characteristics, patient characteristics, provider characteristics, language concordance  
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14 120 assessment, and outcome assessment) and study findings. Language concordance assessment  
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16 121 data include information on which informant was used to determined language concordance  
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18 122 (e.g., patient report that language concordance occurred) and how comparator groups were  
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20 123 formed. To illustrate, several studies included patients and providers that communicated through  
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22 124 an interpreter (referred throughout as ‘interpreter use’) in the language-discordant group.  
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24 125 Similarly, several studies sampled patients and providers that communicated directly in English  
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26 126 (referred throughout as ‘English-English’) and included this group in the language-concordant  
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28 127 group (grouping English-English with patients and providers that directly communicated in a  
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30 128 non-English language). We did not exclude studies for classifying interpreter use and English-  
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32 129 English as language-concordant as long as the language-concordant group included patients and  
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34 130 providers who were able to communicate directly in a shared non-English language (the  
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36 131 definition of language concordance). To capture this information, we created variables to  
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38 132 represent whether a study (1) included interpreter use in the language-discordant group (yes/no),  
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40 133 and (2) included English-English in the language-concordant group (yes/no).

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42 134 Health outcomes were categorized into four domains. Patient behaviors were defined as  
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44 135 patient actions that indicate participation in care (e.g., medication adherence). Provider behaviors  
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46 136 were defined as provider actions that influence patient health but exclude routine assessments  
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48 137 and procedures. To illustrate, we considered outcomes such as timeliness of treatment as  
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3 138 provider behaviors but not routine clinical procedures such as cancer screenings. Interpersonal  
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5 139 processes of care included measures of patient-provider relationship or clinical encounter quality  
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8 140 (e.g., satisfaction with care). Finally, clinical outcomes included risk factor laboratory values  
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10 141 (e.g., hemoglobin [Hb] A1c), routine assessments and procedures (e.g., vaccinations), and other  
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12 142 healthcare-relevant outcomes (e.g., length of hospitalization).

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15 143 Study findings were coded at the level of the individual outcome. When studies reported  
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17 144 associations for individual outcomes and composite outcomes that include those individual  
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19 145 outcomes, only the individual outcomes were extracted. For example, if a study reports  
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21 146 associations for three outcomes of influenza vaccination, tetanus vaccination, and ‘any  
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23 147 vaccination,’ only the first two associations (influenza vaccination and tetanus vaccination) are  
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26 148 extracted.

## 27 28 149 RESULTS

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31 150 The flow chart in Figure 2 depicts the study selection process. Thirty-eight studies were  
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33 151 included in the final qualitative analysis. Table 1 summarizes study descriptives, Table 2  
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35 152 presents methodological details of each of the selected studies, Table 3 summarizes main  
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37 153 findings and limitations of each of the selected studies, and Table 4 summarizes findings  
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40 154 regarding associations of language concordance with health outcomes across the selected studies.

### 41 42 155 Study characteristics

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45 156 Study year, sample size, and design. Publication years ranged from 1985-2017. Over  
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47 157 three-quarters ( $k=30$ , 78.9%) included more than 200 participants. Over half ( $k=21$ , 55.2%) used  
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49 158 a cross-sectional design. This limits the literature in three ways. First, cross-sectional designs  
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51 159 cannot elucidate temporal relationships between language concordance and health outcomes.  
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54 160 Second, some outcomes (e.g., HbA1c) require longer follow-up periods to detect meaningful



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3 161 changes. Third, cross-sectional studies cannot account for self-selection biases that may exist  
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5 162 between patients with and without language-concordant providers.

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7 163 Because access to language services is a health right, randomized controlled trials (RCTs)  
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9 164 with a language-discordant arm are considered unethical (Jacobs et al., 2006) and not used in this  
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11 165 literature. However, cluster-RCTs comparing ‘usual care’ clinics to ‘intervention’ clinics (i.e.,  
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13 166 with specialized language-concordant care teams) are rigorous and appropriate for examining  
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15 167 these questions. Further, other rigorous designs—such as quasi-experimental longitudinal  
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17 168 designs— are feasible in hospital settings that routinely track patients and document health  
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19 169 outcomes. For example, Parker and colleagues (2017) used a quasi-experimental pre-post design  
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21 170 to examine glycemic control among Latinos with type 2 diabetes switching from a language-  
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23 171 discordant to a language-concordant provider. These quasi-experimental longitudinal designs  
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25 172 provide stronger evidence of causality than cross-sectional studies while keeping within the  
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27 173 bounds of ethical research.

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29 174 Region. Over half of the studies ( $k=21$ , 55.5%) were conducted in a Western state; an  
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31 175 additional two multi-site studies included California sites. This West-dominant pattern may bias  
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33 176 knowledge about language concordance and health outcomes. This is problematic, as region-  
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35 177 specific factors could influence health outcomes. To illustrate, California (represented in  $k=20$ ,  
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37 178 52.6% of studies in this review) leads the most comprehensive state-level effort to prohibit  
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39 179 national origin discrimination, which includes discrimination based on language service access  
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41 180 (Youdelman, 2008). Findings from these contexts may not generalize to contexts where  
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43 181 protections are less comprehensive. This is particularly important when considering the  
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45 182 emergence of ‘new immigrant destinations’ – destinations previously not considered major  
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47 183 immigrant hubs that are experiencing rapid growth in their immigrant population. Certain new  
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184 destinations (e.g., Raleigh-Durham, NC, and Indianapolis, IN) are experiencing immigrant  
185 growth rates that triple the national rate (Singer, 2015). Further, around half of immigrants living  
186 in new destinations have LEP (Terrazas, 2011). These rapid demographic changes challenge new  
187 destinations to adapt their healthcare systems to deliver equitable care. In adapting, these  
188 destinations become ‘natural experiments’ in which quasi-experimental longitudinal designs  
189 could examine how the introduction of language-concordant care might influence the health of  
190 their new immigrant communities.

191 Healthcare setting. The majority of studies ( $k=21$ , 55.2%) sampled from a general  
192 outpatient/primary care clinic. An additional five (of six) multi-site/other studies sampled from a  
193 general outpatient/primary care setting in addition to another setting (e.g., emergency/urgent  
194 care). Thus, general outpatient/primary care clinics were represented in over half ( $k=21$ , 55.2%)  
195 of the studies. As general outpatient/primary care is usually the first point of contact in  
196 healthcare, continued research in these settings is critical. However, the effects of language-  
197 concordant care in specialty settings remains understudied.

#### 198 Patient characteristics

199 Age, gender, and race/ethnicity. Participants’ mean/median age ranged from 29 years [6]  
200 to 68 years [31]. In the 34 studies that reported gender, women were the majority in 31 (81.6%).  
201 The most widely represented racial/ethnic group was Hispanics/Latinos ( $k=21$ , 55.2%). Notably,  
202 twelve studies (31.6%) did not report patient race/ethnicity. In some cases, race/ethnicity could  
203 be inferred through language (e.g., Vietnamese-speaking patients are likely Asian), whereas this  
204 inference was more difficult with languages commonly spoken across groups (e.g., Hispanic  
205 Whites and Hispanic Blacks). Race/ethnicity data are critical for characterizing samples,

## Language Concordance and Health Outcomes 10

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3 206 determining the generalizability of results, and assessing the unique and combined effects of  
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5 207 race/ethnicity and language concordance on health outcomes (National Research Council, 2004).

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7 208 Immigrant status. While 14 studies (36.8%) reported on immigrant status, the remaining  
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9 209 ( $k=24$ , 63.2%) did not. Immigrant status is an important social determinant of health (Castañeda  
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11 210 et al., 2015) and 81% of individuals with LEP are immigrants (Zong & Batalova, 2015a). While  
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13 211 LEP may be a proxy for immigrant status, the two are not interchangeable. In fact, immigrant  
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15 212 status could influence the effects of language concordance on health outcomes. For example,  
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17 213 U.S.-born individuals with LEP may benefit from U.S.-citizenship status, which is linked to  
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19 214 higher health insurance coverage rates (Goldman, Smith, & Sood, 2005). Similarly, factors  
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21 215 associated with being foreign-born may exert a health-protective effect, although evidence for  
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23 216 this ‘immigrant health paradox’ is mixed (Teruya & Bazargan-Hejazi, 2013). The complex  
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25 217 relationship between immigrant status and health underscores the importance of collecting  
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27 218 immigrant status data.

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29 219 Language spoken. Spanish was the most represented language across studies ( $k=28$ ,  
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31 220 73.7%), followed by Chinese ( $k=7$ , 18.4%) and Vietnamese ( $k=5$ , 13.2%). According to the 2013  
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33 221 American Community Survey, 44% of the 37 million Spanish-speaking people in the U.S. have  
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35 222 LEP. Thus, when it comes to the total number of people with LEP, Spanish ranks first. Chinese  
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37 223 ranks second with nearly 3 million speakers in the U.S., 55% of whom have LEP. However,  
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39 224 while Vietnamese ranks fourth in total number of speakers, Vietnamese ranks first in proportion  
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41 225 of speakers who have LEP (60%). Therefore, the likelihood that someone who speaks  
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43 226 Vietnamese also requires care in Vietnamese is greater.

227 Provider characteristics

228 Type. Twenty-one (55.3%) studies specified a physician as the provider (studies using the  
229 word ‘provider’ without further elaboration were classified as referring to physicians). Few  
230 studies asked about the physician in tandem with another healthcare professional, such as a  
231 nurse. As healthcare continues to adopt collaborative care models, wherein teams of diverse  
232 providers care for the same patient (Reiss-Brennan et al., 2016), it becomes increasingly  
233 important to acknowledge patients’ relationships with non-physician providers.

234 Race/ethnicity. The vast majority ( $k=30$ , 78.9%) of studies did not report information on  
235 provider race/ethnicity. The available evidence, although limited, suggests that language-  
236 concordant providers are more racially/ethnically diverse than the general population of  
237 providers (DataUSA, 2018). Racial/ethnic minority physicians are more likely to care for  
238 racial/ethnic minority patients, practice in underserved areas, and care for poor patients and those  
239 with Medicaid or no insurance (Cooper & Powe, 2004) – all which tend to be characteristics of  
240 populations with LEP (Kaiser Family Foundation, 2012). Likewise, minority patients prefer  
241 ethnic-concordant physicians, in part, because of language and empathic treatment concerns  
242 (Garcia et al., 2003; Saha et al., 2000). Further, patient-provider race concordance studies often  
243 highlight the important role of language in the patient-provider relationship (Shen et al., 2017;  
244 Meghani et al., 2009). The reverse is also likely – namely, that provider race/ethnicity is relevant  
245 to patients in the context of patient-provider language concordance. Documenting these provider  
246 demographics will aid future work comparing the relative contribution of patient-provider  
247 racial/ethnic-concordance to language-concordance on health outcomes.

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248 Language concordance assessment

249 Informant. Over a third ( $k=14$ , 36.8%) of the studies did not specify whether language  
250 concordance occurred but instead inferred that language concordance occurred. In a few cases,  
251 language concordance was inferred by study design. For example, Dunlap and colleagues (2015)  
252 [8] tested associations of language concordance with patient satisfaction and clinical  
253 understanding by comparing a Spanish-speaking pediatric surgery clinic to a general pediatric  
254 surgery clinic. Here, it is reasonable to infer that patients from the Spanish-speaking clinic  
255 received care in Spanish. However, as noted by the authors, patients in the Spanish-speaking  
256 clinic may have elected to speak English during the appointment, introducing uncertainty about  
257 the determination of language concordance.

258 More problematic are cases in which studies inferred that language concordance occurred  
259 because providers self-reported fluency in a language, thus assuming that clinical encounters  
260 between those providers and their patients with LEP were indeed language concordant. This  
261 approach is imprecise for two reasons. First, providers could misestimate their own language  
262 fluency (Diamond et al., 2014). Further, several studies used hospital hiring records to determine  
263 providers' self-reported fluency, and language fluency strengthens or decays over time. Second,  
264 regardless of actual language fluency, it is possible that a specific clinical encounter was  
265 conducted in English. Identifying these particular encounters as completed in a non-English  
266 language would result in misclassification. For these reasons, patient report (e.g., 'Did your  
267 provider use your language in the visit today?'), which was used in over a third ( $k=14$ , 36.8%) of  
268 the studies, is the 'gold standard' for assessing language concordance. For similar reasons,  
269 language fluency should be examined from the patient's perspective. Fernandez and colleagues  
270 (2011) [12] provide an excellent example of this practice by asking patients, "Without using an

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3 271 interpreter, how well does your personal physician speak your language?” and permitting  
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5 272 patients to select from a list of six responses ranging from “does not speak my language” to  
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8 273 “very well.”  
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10 274 Classifying language-concordant and language-discordant groups. Several studies  
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12 275 included patient-provider dyads that communicated through an interpreter (classified as language  
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14 276 discordant). Multiple studies also sampled dyads that communicated directly in English  
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17 277 (‘English-English’), classifying this group as language concordant. Variation in  
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19 278 inclusion/exclusion of interpreter use and English-English groups often resulted in multiple  
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21 279 comparisons, for a single outcome, within a single study. Therefore, the present results are  
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23  
24 280 interpreted at the level of the individual outcome ( $n=203$ ).  
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26 281 Interpreter use dyads were most often classified as language discordant, as 116 outcomes  
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28 282 (57.1%) included them in the language-discordant group whereas only 15 outcomes (7.4%)  
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31 283 excluded them from this group, and 176 outcomes (86.7%) excluded them from the language-  
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33 284 concordant group. The number of outcomes that classified English-English dyads as language  
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35 285 concordant ( $n=103$ , 50.7%), as compared to those that did not ( $n=90$ , 44.3%), were similar. No  
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38 286 information was provided on classification criteria for this group for 10 (4.9%) outcomes. This  
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40 287 could have important implications, as English-English dyads could be inflating detected  
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42 288 associations (e.g., English-English dyads reporting better understanding their providers’  
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45 289 discharge instructions). Therefore, we conducted a subanalysis of the 90 associations from 20  
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47 290 studies that did not include English-English dyads in the language concordant group to examine  
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49 291 whether the inclusion of English-English dyads meaningfully changed the results.  
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## Language Concordance and Health Outcomes 14

292 Outcome assessment

293 Patient report was used to measure 135 (66.5%) outcomes. Only one study [5] of patient-  
294 provider agreement collected outcome measures from providers. The lack of provider-reported  
295 outcomes for interpersonal processes of care is important, as previous research demonstrates a  
296 reciprocal relationship between patients' and providers' thoughts and actions (LeBlanc et al.,  
297 2009; Street, Gordon, & Haidet, 2007). Yet, this review indicates that providers are often  
298 excluded from the equation, thus limiting our understanding of possible mechanisms underlying  
299 patients' reported interpersonal processes of care outcomes.

300 Associations between language concordance and patient behaviors

301 Patient behaviors were examined across 23 outcomes from nine studies [3, 7, 11, 18, 19,  
302 21, 24, 25, 34]. Six (26.1%) of these associations were significant and favored language-  
303 concordant care; 17 (73.9%) detected no association (Table 4).

304 Within specific patient behaviors, the evidence consistently suggests that medication  
305 adherence is not associated with patient-provider language concordance [7, 11, 24, 34]. Of note,  
306 these studies examined adherence to cardiovascular disease (CVD) or asthma medication. This  
307 pattern was found across objective and self-report adherence measures, and three [11, 24, 34] of  
308 four studies measured medication adherence longitudinally. Evidence for other adherence is  
309 mixed, with some evidence that language concordance is associated with keeping follow-up  
310 appointments for outpatient care [21, 24], perhaps because patients receiving language-  
311 concordant care develop better interpersonal relationships with their providers; however,  
312 findings for diabetes self-care are mixed [7]. Finally, evidence for other patient behaviors is also  
313 mixed: there is some support for the relationship between language concordance and patient-  
314 initiated questions [19] and disclosure of complementary health approaches [3], suggesting



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3 315 language concordance fosters patient-initiated communication, but no association between  
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5 316 language concordance and going to a usual source of care for healthcare needs [25].  
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8 317 Associations between language concordance and provider behaviors  
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10 318 Provider behaviors were examined across 29 outcomes from eight studies [2, 4, 6, 9, 18,  
11  
12 319 23, 27, 31]. Eight (27.6%) associations were significant and favored language-concordant care;  
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14 320 21 (72.4%) detected no association.  
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16  
17 321 Evidence leans toward supporting no association between language concordance and  
18  
19 322 timeliness of treatment. However, this was assessed in two studies of patients with stroke-mimics  
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21 323 (e.g., seizures misdiagnosed as stroke; [31]) and cancer screening abnormalities [4], both of  
22  
23 324 which are high-stakes situations. The association remains unknown for lower-stakes situations,  
24  
25 325 such as increasing medication dosage for chronic conditions. Evidence leans toward supporting  
26  
27 326 no association between language concordance and risk factor assessment (e.g., family risk factor  
28  
29 327 assessment) [2, 6] or provision of services (e.g., providing health education) [2, 27, 6, 9, 23].  
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31 328 Finally, one study [18] detected no association between language concordance and  
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33 329 overutilization of resources, but findings from this single study should be replicated.  
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37 330 Associations between language concordance and interpersonal processes of care  
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40 331 Outcomes related to interpersonal processes of care represented almost half ( $n=97$ ,  
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42 332 47.8%) of the total outcomes sample across 17 studies [1, 2, 5, 7, 8, 13, 15, 16, 18, 19, 22, 25,  
43  
44 333 27, 30, 32, 36, 38]. Forty-nine (50.5%) of these associations were significant and favored  
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46 334 language-concordant care, one (1%) was significant and did not favor language-concordant care,  
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48 335 and the remaining 47 (48.5%) detected no association.  
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51 336 Interpersonal style includes positive relational attributes such as respect and trust, as well  
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54 337 as negative attributes such as discrimination. Evidence leaned toward supporting a positive  
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## Language Concordance and Health Outcomes 16

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3 338 association [1, 7, 13, 15, 19, 22, 25, 27, 32]; however, there was an interesting pattern wherein  
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5 339 language concordance was associated with lower perceived discrimination when asking patients  
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7 340 to specifically consider discrimination related to accent or language [15, 32], but not when  
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9 341 considering discrimination in general [19, 32]. Future research could differentiate perceived  
10  
11 342 language discrimination versus other discrimination forms to better understand the mechanisms  
12  
13 343 underlying poor patient-provider relationships.  
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17 344 As can be seen in Table 4, evidence for communication/information quality (e.g., ‘Did  
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19 345 you have a difficult time understanding your provider?’) [7, 8, 13, 15, 16, 19, 22, 25, 32, 38]  
20  
21 346 favored language concordance. Specifically, 12 (66.7%) associations favored language  
22  
23 347 concordance [7, 8, 13, 15, 19, 22, 38], while 6 (33.3%) did not [16, 25, 32]. Evidence for  
24  
25 348 satisfaction (e.g., with provider) [8, 13, 15, 16, 18, 22, 27, 30] was mixed. Specifically, 7 (50%)  
26  
27 349 of the associations favored language-concordant care [8, 13, 15, 18, 22] and 7 (50%) detected no  
28  
29 350 association [13, 16, 18, 22, 27, 30]. The evidence leans towards supporting no association  
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31 351 between language concordance and shared decision-making (e.g., ‘Did your provider involve  
32  
33 352 you in decisions?’) [2, 7, 25, 32], spending enough time with the patient [1, 13, 32], and other  
34  
35 353 interpersonal processes of care (e.g., therapeutic alliance) [2, 5, 16, 22, 25 36]. Finally, evidence  
36  
37 354 leans toward supporting a positive association between language-concordant care and ratings of  
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39 355 provider’s listening skills or feeling understood [13, 16, 22, 32].  
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45 356 Associations between language concordance and clinical outcomes  
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47 357 Clinical outcomes were examined across 54 outcomes from 17 studies [6, 10, 12, 14, 17,  
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49 358 18, 20, 23, 26, 28, 29, 30, 31, 33, 35, 37]. Sixteen (29.6%) of these associations were significant  
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51 359 and favored language-concordant care, four (7.4%) were significant and did not favor language-  
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53 360 concordant care, and the remaining 34 (63%) detected no association.  
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3 361 Evidence consistently suggests no association between language concordance and  
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5 362 assessments and procedures [6, 10, 20, 23, 29, 31, 33, 37]. Within cancer screens, however,  
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7 363 evidence suggests a possible negative relationship with colorectal cancer (CRC) screens [9, 20].  
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10 364 One avenue for future research is to conduct qualitative studies with patients and providers to  
11  
12 365 uncover reasons underlying this negative relationship. While evidence does not support an  
13  
14 366 association between language concordance and tetanus or flu vaccinations [10, 20], other  
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16 367 vaccinations – such as vaccinations for children – should be examined in future studies.

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19 368 Evidence for risk factor control leaned toward supporting a positive association [12, 17,  
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21 369 26, 28] with evidence for improvements in glycemic control [26, 28] and low-density lipoprotein  
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23 370 cholesterol [12, 26, 28] in patients with diabetes. A key next step is to determine whether this  
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25 371 important finding extends to other risk factors and chronic disease patient populations.

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28 372 For emergency department visits/hospitalizations, evidence was mixed [14, 17, 18] and  
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30 373 may depend on the reason for admittance. Finally, for other clinical outcomes (e.g., length of  
31  
32 374 hospitalization), the evidence was also mixed [14, 18, 30, 35].

### 35 375 Subanalysis Excluding English-English Dyads

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38 376 Removing English-English dyads seemed to have an effect on three of the four domains,  
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40 377 but in different directions (see supplemental online Table 1). Specifically, the percentage of  
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42 378 associations in favor of language concordance decreased 9.5% for patient behaviors and 9% for  
43  
44 379 clinical outcomes, while the percentage of associations in favor of language concordance  
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46 380 increased 18.6% for provider behaviors (and 1.1% for interpersonal processes of care).  
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48 381 Nevertheless, results remained split between supporting a positive association versus no  
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50 382 association of language concordance with patient behaviors (16.6% vs. 83.3%), provider  
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52 383 behaviors (46.2% vs. 53.8%), interpersonal processes of care (51.6% vs. 48.4%), and clinical  
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## Language Concordance and Health Outcomes 18

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3 384 outcomes (20.6% vs. 67.6%). Overall, associations across the four domains remained in the same  
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5 385 direction.  
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## 8 386 DISCUSSION

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10 387 Studies of patient-provider language concordance and health outcomes are largely cross-  
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12 388 sectional, concentrated in Western states, conducted in primary care settings, and focused on  
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14 389 Spanish-speaking patients and physician providers. Findings regarding the associations of  
15  
16 390 language concordance with the global health outcome domains of this systematic review (patient  
17  
18 391 behaviors, provider behaviors, interpersonal processes of care, and clinical outcomes) split  
19  
20 392 between favoring language-concordant care (26-51% of outcomes) and detecting no association  
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22 393 (49-74% of outcomes; see Table 4). Thus, at present, there is some intriguing evidence of a  
23  
24 394 potential salutary effect of language-concordant care for each global health outcome domain. It  
25  
26 395 should be noted that this literature is fraught with methodological limitations, some of which  
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28 396 would increase the likelihood of obtaining null results and may explain the relatively high  
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30 397 number of null results. Of particular relevance in this regard are inconsistencies in the definition,  
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32 398 classification, and assessment of language concordance. It is also worth noting that there was  
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34 399 virtually no evidence of a potential deleterious effect of language-concordant care.  
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40 400 At the health outcome subdomain level, the available evidence indicates that language  
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42 401 concordance is consistently not associated with medication adherence, provision of services, or  
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44 402 assessments and procedures. It also leans towards supporting no association between language  
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46 403 concordance and timeliness of treatment, risk factor assessment, patient ratings of shared  
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48 404 decision-making, and spending enough time with the patient. Conversely, the available evidence  
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50 405 leans towards supporting associations between language-concordant care and better patient  
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52 406 ratings of provider interpersonal style, communication/information quality, listening skills and  
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3 407 feeling understood, and better risk factor control. At present, evidence for the remaining  
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5 408 subdomains is either mixed or lacking. Based on these results and the methodological limitations  
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8 409 identified in this literature, we present an evidence map, identify knowledge gaps, and propose a  
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10 410 future research agenda.

#### 11 12 411 Evidence map

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15 412 Our evidence map presented in Figure 3 provides a roadmap of the potential relationships  
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17 413 between patient-provider language concordance and health outcomes based on the reviewed  
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19 414 evidence. The intentions of this map are to: (1) raise awareness about the existing breadth of  
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21 415 knowledge regarding language concordance-health outcome relationships, and (2) direct  
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23 416 attention to unexamined gaps in this literature. As such, the figure includes a number of potential  
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26 417 topics (in italics) for future research.

#### 27 28 418 Future research agenda

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31 419 An important finding of our review is that key methodological limitations currently  
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33 420 prevent strong scientific inferences from being drawn regarding the links between language  
34  
35 421 concordance and health outcomes and may be contributing to the relatively high number of null  
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37 422 results. Because we believe that a future research agenda that addresses these limitations should  
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39 423 be adopted, we propose such an agenda with specific recommendations. Overall, the most  
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42 424 important next steps are to:

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44 425 1. Conduct quasi-experimental longitudinal studies or cluster-RCTs examining changes in health  
45  
46 426 outcomes following care from a language-concordant providers. The temporal relationship  
47  
48 427 between language concordance and health outcomes remains unknown, as the majority of studies  
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50 428 were cross-sectional in design. Quasi-experimental longitudinal studies and cluster randomized  
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## Language Concordance and Health Outcomes 20

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3 429 controlled trials provide stronger evidence of causality while keeping within the bounds of  
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5 430 ethical research. If not possible, collect longitudinal data for observational designs.

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8 431 2. Increase research in ‘new immigrant destinations’ and with underrepresented languages. ‘New  
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10 432 immigrant destinations’ provide excellent opportunities to conduct quasi-experimental  
11  
12 433 longitudinal studies, as these destinations become ‘natural experiments’ in which researchers  
13  
14 434 could examine how the introduction of language-concordant care might influence the health of  
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16 435 the new immigrant community. Further, increasing the representation of other languages with  
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18 436 high proportions of speakers with LEP will improve the relevancy of the evidence to the general  
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20 437 population with LEP.

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23  
24 438 3. Exclude patients who elect to speak with their providers in English or through an interpreter.

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26 439 The literature lacks a consistent definition of ‘language-concordant care’ (i.e., studies group  
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28 440 English-English and interpreter use dyads with individuals who speak directly to their providers  
29  
30 441 in a non-English language). Analyses excluding patients who elect to speak with their providers  
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32 442 in English or through an interpreter will clarify the extent to which these variables might be  
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34 443 influencing observed associations.

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38 444 4. Verify language concordance and language fluency through patient report. Assessing language

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40 445 concordance via sources other than the patients themselves introduces uncertainty about  
41  
42 446 assessment precision, while measuring language concordance as a dichotomous variable likely  
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44 447 masks considerable variance in language fluency. Confirming that patients understand the care  
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46 448 received in their preferred languages will help improve assessment accuracy and assure that  
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48 449 those with LEP actually receive the services they need.

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51 450 5. Document race/ethnicity, immigrant status, and language spoken. Providing limited

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53 451 information on these patient factors limits knowledge of the unique and combined effects of  
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3 452 these factors and language concordance on health outcomes. Additional useful information  
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5 453 includes country of origin, length of U.S. residence, and provider sociodemographic factors.  
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8 454 6. Test for candidate mechanisms underlying relationships between language concordance and  
9  
10 455 health outcomes. Elucidating mechanisms would identify targets for interventions designs to  
11  
12 456 improve care for people with LEP. The reviewed evidence suggests that proximal changes in  
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14 457 interpersonal processes of care may partially mediate the relationship between language  
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16 458 concordance and downstream health outcomes. For example, decreasing patient perceptions of  
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18 459 language-based discrimination could increase patient participation in decision-making, which, in  
19  
20 460 turn, could result in a more acceptable treatment plan, improved treatment adherence, and better  
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22 461 clinical outcomes.  
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25  
26 462 Particular to the last suggestion, data from qualitative studies support the importance of  
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28 463 interpersonal processes of care for patients with LEP. For example, in focus groups for Latina  
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30 464 mothers using pediatric health services, participants described associating their encounters with  
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32 465 bilingual providers with eased communication, improved understanding, and strengthened  
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34 466 rapport, whereas they associated encounters facilitated by interpreters as undermining their  
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36 467 relationship with the provider and feelings of betrayal. Further, several participants described  
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38 468 instances of humiliation and discrimination associated with their language-discordant encounters  
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40 469 (Steinberg, Valenzuela-Araujo, Zickafoose, Kieffer, & Decamp, 2016). Similarly, in focus  
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42 470 groups with low-income Spanish-speaking women, participants receiving care in both English  
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44 471 and Spanish described associating Spanish-speaking providers with clear communication,  
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46 472 security, and trust. Further, while participants reported an appreciation for the interpretation  
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48 473 services they received when with language-discordant providers, many nevertheless associated  
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50 474 their communication with language-discordant providers to be poor, citing perceived insufficient  
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## Language Concordance and Health Outcomes 22

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3 475 or miscommunicated provision of health information by the provider (Simon et al., 2013). In  
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5 476 light of the reviewed evidence and these qualitative findings, there is intriguing evidence  
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7 477 suggesting improvements in interpersonal processes of care may be one mechanism linking  
8  
9 478 language concordance to improvements in other health outcomes. As previously described, over  
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11 479 half of the reviewed evidence used cross-sectional data, and these designs are unable to test for  
12  
13 480 these mechanisms. This limitation may be an important factor contributing to the conflicting  
14  
15 481 findings detected in this review.  
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18  
19 482 Limitations of the present review  
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22 483 Several limitations should be considered. First, because we included only peer-reviewed  
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24 484 articles, publication bias is possible. Second, we did not exclude studies based on how the  
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26 485 language concordance groups were defined. As such, studies that included English-English  
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28 486 dyads and interpreter use dyads were included among selected studies. Although this allowed us  
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30 487 to raise awareness of this methodological limitation and offer a specific recommendation for  
31  
32 488 future studies, it likely also created ambiguity regarding the true relationship between language  
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34 489 concordance and health outcomes specifically among people with LEP. Third, there was  
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36 490 substantial heterogeneity in study quantity and quality within each examined health outcome  
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38 491 domain. While our comprehensive qualitative approach provided a critical overview of the  
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40 492 evidence base and informed our future research agenda, meta-analyses with focused research  
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42 493 questions should be considered as the literature matures (i.e., when there is a sufficient number  
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44 494 of studies in a focused area, such as medication adherence). This systematic review is designed  
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46 495 to stimulate and improve the rigor of future research so that such meta-analyses will become  
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48 496 possible.  
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3 497 Research and clinical implications  
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5 498 This review evaluated the state of the literature on language concordance and health  
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8 499 outcomes, identified key limitations and gaps, proposed specific strategies to address them, and  
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10 500 provided an organizing map of the evidence. Figure 3 provides a roadmap of the research areas  
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12 501 that have and have not received attention, while the research agenda lays the groundwork for  
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14 502 designing successful future studies in these areas. It is our hope that this review will stimulate  
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16 503 rigorous, clinically relevant research on language concordance-health outcome relationships that  
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18 504 ultimately inform clinical practice and policy.

19 505 Concerning clinical practice and policy implications, we acknowledge that challenges  
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21 506 associated with recruiting and retaining bi- and multi-lingual healthcare providers remain. The  
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23 507 use of professional interpreters continues to be essential, especially for less prevalent languages,  
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25 508 and several other systematic reviews support the effectiveness of this practice (i.e., Flores, 2005;  
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27 509 Karliner et al., 2007; Bauer & Alegría, 2010; Silva et al., 2016). The results of our review on  
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29 510 language-concordant care are also promising and can increase providers' awareness of the  
30  
31 511 potential importance of this method for providing care to people with LEP. Based on the results  
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33 512 of this review, policymakers should encourage healthcare organizations to collect information on  
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35 513 their patients' preferred languages and to adopt more rigorous methods of documenting whether  
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37 514 language-concordant care was achieved, such as by confirming with the patients rather than with  
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39 515 the providers.

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41  
42 516 Final conclusions  
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45 517 Providing high-quality healthcare to an increasingly diverse patient population is a major  
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47 518 U.S. public health priority. People with LEP face significant barriers to achieving and  
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49 519 maintaining good health. Facilitating patient-provider language concordance is one potential  
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## Language Concordance and Health Outcomes 24

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3 520 mechanism for addressing the significant and deleterious impact of language barriers in  
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5 521 healthcare. While the available evidence is largely mixed and limited by methodological issues,  
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7 522 there is a critical need for rigorous, clinically relevant research to enhance our understanding of  
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9 523 the importance and potential benefits of patient-provider language concordance in improving  
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11 524 healthcare and outcomes for the growing and vulnerable population of people with LEP.  
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Table 1. Characteristics of 38 Included Studies Examining Patient-Provider Language Concordance and Health Outcomes

	<i>k</i>	<i>%</i>		<i>k</i>	<i>%</i>
<b>Study Characteristics</b>			<b>Patient Characteristics (cont.)</b>		
<b>Year of publication</b>			<b>Immigrant status</b>		
1985-2005	9	24	Reported	14	37
2006-2010	10	26	Not reported	24	63
2011-2015	13	34	<b>Language spoken<sup>b</sup></b>		
2016-2017	6	16	Spanish	28	74
<b>Sample size</b>			Chinese	7	18
< 200	8	21	Vietnamese	5	13
200 - 999	17	45	Russian	3	8
1000 -1999	6	16	Portuguese	3	8
2000 -9999	4	11	Haitian Creole	2	5
10000 - 30000	3	8	No restriction	3	8
<b>Study design</b>			Other languages <sup>d</sup>	1	3
Cross-sectional	21	55	<b>Providers Characteristics</b>		
Cohort	13	34	<b>Type</b>		
Intervention	4	11	Physician	21	55
<b>Region</b>			Physician or nurse	7	18
Northeast	11	29	Physician and healthcare team	3	8
Midwest	1	3	Patient navigator	2	5
South	1	3	Behavioral health care provider	1	3
West	21	55	Usual source of care	3	8
National	2	5	Not reported	1	3
More than one	2	5	<b>Race/ethnicity<sup>b</sup></b>		
<b>Healthcare setting</b>			Hispanic/Latino	8	21
General outpatient/primary care	21	55	Asian	6	16
Inpatient	1	3	African American/Black	4	11
Specialty clinic	5	13	White	7	18
None (e.g., phone survey)	5	13	Other <sup>c</sup>	3	8
Other/multiple	6	16	Not reported	30	79
<b>Patient Characteristics</b>			<b>Language Concordance Assessment</b>		
<b>Age<sup>a</sup></b>			<b>Informant</b>		
Age < 65	31	82	Patient report	14	37
Not reported	3	8	Hospital records or third party	3	8
<b>Gender</b>			Multiple	3	8
Female 0-49% of sample	3	8	Not reported/not clear	18	47
Female 50-100% of sample	31	82	<b>Outcome Assessment<sup>e</sup></b>		
Not reported	4	11	<b>Informant</b>		
<b>Race/ethnicity<sup>b</sup></b>			Patient report	135	67
Hispanic/Latino	21	55	Hospital records or third party	68	33
Asian	10	26	Patient and provider report	6	3
African American/Black	8	21			
White	12	32			
Other <sup>c</sup>	8	21			
Not reported	12	32			

Note. <sup>a</sup>Mean/median/largest range. <sup>b</sup>Results presented as representation across all studies. <sup>c</sup>Other category used in some studies to capture participants that did not fall a designated race/ethnicity category (e.g., multiracial participants) while other studies used the Other category as a catch-all term for participants that did not fall into the racial/ethnic category of the specific group being studied (e.g., White versus Other, including Black, Asian, etc.) <sup>d</sup>Other languages include Armenian, Cambodian, Farsi, Hmong, Tagalog, and Serbo-Croatian, each represented in *k* = 1 study. <sup>e</sup>Results presented at the level of individual outcomes, *n* = 203.

Table 2. *Methodological Details for the 38 Included Studies Examining Patient-Provider Language Concordance and Health Outcomes*

Ref.	First author, year	Study setting, characteristics	Participant characteristics	Language(s)	Language concordance informant; definition	Outcome domain; informant; description	# of outcomes represented in review, # significant
1	Baker (1998)	Cross-sectional study of patients visiting an emergency department in CA	N = 457, median age = 36, % female = 69	Spanish	Patient report; not needing an interpreter	Process; patient report; interpersonal aspects of care	10, 9
2	Boudreau (2010)	Cross-sectional study of patients visiting a community health clinic in MA	N = 438, most populated age range = 25-34, % female = 86.2	Spanish and Other	Patient report; What language do you speak with the doctor or nurse of your child?	Process and provider behavior; patient report; quality of child well-care	8, 0
3	Chao (2015)	Prospective cohort study of patients visiting a safety net primary care clinic in CA	N = 132, mean age = 56, % female = 76.5	Spanish and Chinese	Patient report; how well regular physician spoke Spanish/Cantonese?	Patient behavior; patient self; disclosure of complementary health approaches	1, 1
4	Charlot (2015)	Prospective cohort study of patients visiting a community health clinic in MA	N = 1257, most populated age range = 40-59, % female = 100	Spanish, Vietnamese, and Other	Not reported; patients and patient navigators who were able to communicate in the same language	Provider behavior; hospital records; time to diagnostic resolution for breast cancer and cervical cancer screening abnormalities	8, 2
5	Clark (2004)	Prospective cohort study of patients visiting an internal medicine or family medicine clinic in NM	N = 427, mean age = 48, % female = 67	Spanish	Patient report; whether physician fluently spoke in native language at visit	Process; patient and provider report; patient-provider agreement about recommended changes in patient health behavior	6, 2
6	de Bocanegra (2011)	Cross-sectional study of patients visiting a general outpatient/primary care or family planning/reproductive health clinic in CA	N = 1589, mean age = 56, % female = 88.8	Spanish	Not reported; clinician proficiency in patient's primary language	Provider behavior and clinical outcome; hospital records; reproductive health counseling and chlamydia testing	10, 3

7	Detz (2014)	Cross-sectional study of patients visiting a safety net clinic in CA	<i>N</i> = 250, mean age = 54.4, % female = 58	Spanish	Not reported; providers asked to rate own Spanish fluency	Patient behavior and process; patient report; interpersonal aspects of care and diabetes care	10, 6
8	Dunlap (2015)	Prospective cohort study of patients visiting a pediatric surgery clinic in CA	<i>N</i> = 177, age = NR, % female = NR	Spanish	Not reported; Spanish-speaking families who communicated directly with their medical team at the Hispanic Clinic for Pediatric Surgery	Process; patient report; satisfaction and clinical understanding	2, 2
9	Eamranond (2009)	Retrospective cohort study of patients visiting a general outpatient/primary care or community health clinic in MA	<i>N</i> = 306, mean age = 52.6, % female = 62.6	Spanish	Not reported; whether primary care provider could converse fluently in Spanish	Provider behavior; hospital records; lifestyle counseling	3, 2
10	Eamranond (2011)	Retrospective cohort study of patients visiting a general outpatient/primary care or community health clinic in MA	<i>N</i> = 306, mean age = 52.6, % female = 62.6	Spanish	Not reported; whether primary care provider could converse fluently in Spanish	Clinical outcome; hospital records; primary care screening	7, 2
11	Fernández (2017)	Cross-sectional study of patients visiting an integrated care clinic in MA	<i>N</i> = 3205, mean age = 55.6, % female = 46.6	Spanish	Not reported; providers asked to rate own Spanish fluency	Patient behavior; hospital records; diabetes medication nonadherence	5, 0
12	Fernandez (2011)	Cross-sectional study of patients visiting an integrated care clinic in MA	<i>N</i> = 252, mean age = 56.8, % female = 71.8	Spanish	Patient report; without using an interpreter, how well personal physician speaks patient's language?	Clinical outcome; hospital records; poor glycemic control	1, 1
13	Gany (2007)	Randomized controlled trial of patients visiting a general outpatient/primary care	<i>N</i> = 1276, most populated age range = 34-64, % female = 50.9	Spanish and Chinese	Not reported; provider asked to assess language abilities	Process; patient report; satisfaction with provider communication/care	9, 6



		clinic or emergency department in NY					
14	Goncalves (2013)	Cross-sectional study of patients visiting a behavioral health clinic in MA	<i>N</i> = 1328, most populated age range = 35-54, % female = 73.3	Portuguese	Not reported; any Portuguese-speaking patient with a visit to the Portuguese Mental Health Program	Clinical outcome; hospital records; adequate mental health treatment	3, 1
15	González (2010)	Cross-sectional study of respondents from a nationally-representative survey	<i>N</i> = 2921, mean age = 40.6, % female = 46.6	Spanish	Patient report; preference for English or Spanish and appointment usually done in English or Spanish	Process; patient report; confusion, frustration, or language-related poor quality ratings, overall quality of care	4, 4
16	Green (2005)	Cross-sectional study of patients visiting a community health clinic in NY, MA, TX, CA, or WA	<i>N</i> = 2715, mean age = 53.4, % female = 67.5	Chinese and Vietnamese	Patient report; what language did your doctor or nurse speak to you?	Process; patient report; communication and visit ratings	6, 2
17	Hacker (2012)	Retrospective cohort study of patients visiting a general outpatient/primary care clinic in MA	<i>N</i> = 1425, most populated age range = 70+, % female = 61.1	Portuguese, Haitian Creole, Spanish, Other/Unknown	Not reported; provider asked to report language fluency during hiring process	Clinical outcome; hospital records; diabetes-related health	4, 1
18	Jacobs (2007)	Prospective cohort study of patients in an inpatient unit in IL	<i>N</i> = 323, mean age = 48.4, % female = 51.8	Spanish	Provider report and objective testing; providers reported practicing in Spanish-speaking country who indicated they conducted the visit in Spanish OR scored proficient on American Council on the Teaching of Foreign Languages oral proficiency interview	Patient behavior, provider behavior, process, clinical outcome; patient report and hospital records; resource utilization, patient satisfaction, emergency department visits/hospitalizations and adherence to follow-up appointments	9, 3



19	Jaramillo (2016)	Prospective cohort study of patients visiting a pediatric surgery clinic in CA	<i>N</i> = 156, age = NR, % female = NR	Spanish	Other (bilingual research assistant coded interactions); Spanish speaking without an interpreter	Patient behavior and process; patient report and research assistant coding; communication and patient-initiated questions	4, 2
20	Jih (2015)	Cross-sectional study of respondents from a nationally-representative survey	<i>N</i> = 1884, mean age = 53.2, % female = 100	Spanish and Chinese	Patient report; provider communicated in same language as patient and patient did not have difficulty understanding their provider	Clinical outcome; patient report; preventive care services	6, 1
21	Lasser (2005)	Cross-sectional study of patients visiting a general outpatient/primary care clinic in MA	<i>N</i> = 28745, most populated age range = 18-40, % female = 61.3	Portuguese, Haitian Creole, Spanish	Not reported; providers asked to rate own fluency/whether they were a native speaker	Patient behavior; hospital records; missed appointment	1, 1
22	Lee (2002)	Prospective cohort study of patients visiting an urgent care clinic in CO	<i>N</i> = 536, median age = 32, % female = 65	Spanish	Not reported; Spanish-Spanish and English-English speaking dyads	Process; patient report; satisfaction with provider communication/care	24, 11
23	Leng (2011)	Randomized controlled trial of patients visiting a general outpatient/primary care clinic in NY	<i>N</i> = 191, age = NR, % female = NR	Spanish and Chinese	Patient and provider report; both patient and provider reported proficiency and jointly decided not to use an interpreter	Provider behavior and clinical outcome; hospital records; receipt of referral for tuberculin testing and completion of tuberculin testing	2, 0
24	Manson (1988)	Retrospective cohort study of patients visiting a general outpatient/primary care clinic in NY	<i>N</i> = 59, mean age = 55.8, % female = 94.9	Spanish	Not reported; patients with providers who spoke fluent or near fluent Spanish	Patient behavior; hospital records; medication adherence and missing appointments	2, 1
25	Martin (2009)	Cross-sectional study of respondents from a	<i>N</i> = 20052, most populated age range = 0-	No restriction	Patient report; usual source of care	Patient behavior and process; primary care experiences	11, 1

		26nationally- re27representative survey	65, % female = NR		speaks the same language		
26	Mehler (2004)	Retrospective cohort study of patients visiting a general outpatient/primary care clinic or emergency department in CO	<i>N</i> = 55, mean age = 65.4, % female = 58.1	Russian	Not reported; hospital record of patient inability to converse in English matched with Russian-speaking resident	Clinical outcome; hospital record; metabolic control	4, 3
27	Ngo- Metzger (2007)	Cross-sectional study of patients visiting a community health clinic in NY, MA, TX, CA, or WA	<i>N</i> = 2746, mean age = 53.8, % female = 66.7	Chinese and Vietnamese	Patient report; what language did doctor or nurse speak during most recent exam?	Provider behavior and process; patient report; receipt of health education and ratings of interpersonal care and satisfaction with provider	3, 2
28	Parker (2017)	Single group pre-post intervention study of patients visiting a general outpatient/primary care clinic in CA	<i>N</i> = 863, most populated age range = 45-64, % female = 52.3	Spanish	Hospital record data; provider-rated fluency in Spanish OR evidence from utility data that provider delivered care in Spanish without the aid of an interpreter	Clinical outcome; hospital records; glycemic control	4, 2
29	Percac- Lima (2012)	Single group pre-post intervention study of patients visiting a community health clinic in MA	<i>N</i> = 91, mean age = 54, % female = 100	Serbo-Croatian	Not reported; bilingual patient navigator matched to identified Serbo- Croatian patient	Clinical outcome; hospital records; mammogram	1, 1
30	Pérez- Stable (1997)	Cross-sectional study of patients visiting a general outpatient/primary care clinic in CA	<i>N</i> = 236, most populated range = 65-94, % female = 54.2	Spanish	Hospital record data; provider report of Spanish ability, rated understanding of Spanish language, minimum frequency of Spanish use in	Process and clinical outcome; patient report; physical/psychological functioning and well- being, health perceptions pain, and satisfaction with provider	12, 7

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31	Rostanski (2016)	Retrospective cohort study of patients visiting an emergency department in NY	<i>N</i> = 48, mean age = 67.9, % female = 62.3	Spanish, Russian, and Other	Not reported; provider asked to report language fluency	Provider behavior; hospital records; stroke mimic treatment and time to stroke mimic treatment	2, 0
32	Schenker (2010)	Cross-sectional study of patients visiting an integrated care clinic in CA	<i>N</i> = 363, mean age = 58.4, % female = 62.3	No restriction	Patient report; without using an interpreter, how well personal physician speaks patient's language?	Process; patient report; patient satisfaction with provider communication/care	10, 3
33	Sentell (2013)	Cross-sectional study of respondents from a statewide survey in CA	<i>N</i> = 539, most populated range = 50-64, % female = 50.9	Not reported	Patient report; provider spoke same non-English language	Clinical outcome; patient report; colorectal cancer screen	1, 0
34	Traylor (2010)	Cross-sectional study of patients visiting an integrated care clinic in CA	<i>N</i> = 17750, mean age = 60.1, % female = 50	Spanish	Not reported; provider asked to report language fluency during hiring process	Patient behavior; hospital records; cardiovascular disease medication adherence	4, 1
35	Tsoh (2016)	Cross-sectional study of patients recruited from lay health workers' social networks in CA	<i>N</i> = 665, mean age = 62.2, % female = 81	Chinese	Patient report; language usually spoken by provider is Chinese?	Clinical outcome; patient report; rated health	1, 0
36	Villalobos (2016)	Cross-sectional study of patients visiting a general outpatient/primary care clinic in AR	<i>N</i> = 458, mean age = 41.4, % female = 84.1	Spanish	Not reported; bilingual providers	Process; patient report; therapeutic alliance	1, 0
37	Walsh (2009)	Cross-sectional study of patients visiting a general outpatient/primary care clinic in CA	<i>N</i> = 808, mean age = 60.8, % female = 64.7	Vietnamese	Not reported	Clinical outcome; patient report; colorectal cancer screen	3, 0

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38	Wilson (2005)	Cross-sectional study of respondents from a statewide survey in CA	N = 1200, most populated range = 25-44, % female = 58.6	Armenian, Cambodian, Cantonese, Farsi, Hmong, Korean, Mandarin, Russian, Spanish, Tagalog, Vietnamese	Patient report; does your doctor speak patient language?	Process; patient report; difficulty understanding a medical situation	1, 1
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*Note.* CA = California; MA = Massachusetts; NM = New Mexico; NY = New York; TX = Texas; WA = Washington; IL = Illinois; CO = Colorado; AR = Arkansas; NR = not reported.

Table 3. *Major Findings and Limitations for the 38 Included Studies Examining Patient-Provider Language Concordance and Health Outcomes*

First author, year	Major findings	Limitations
<b>Baker (1998)</b>	LC was positively associated with patient satisfaction scores on most to all interpersonal aspects of care (compared to LD-I and LD, respectively).	Cross-sectional study, limited to CA, English-English dyads included in language concordant group
<b>Boudreau (2010)</b>	LC was not associated with reports of higher-quality well-child care among Latino parents.	Low parent response rate, organizational cultural competency may have created a ceiling effect, cross-sectional study, limited to MA, English-English dyads included in language concordant group
<b>Chao (2015)</b>	LC was positively associated with disclosure of complementary health approaches among patients with diabetes.	Only asked about disclosure of complementary health approaches within the past month, limited to CA, English-English dyads included in language concordant group
<b>Charlot (2015)</b>	LC was positively associated with timelier resolution (< 90 days) of cervical cancer screening abnormalities for all language groups. No differences were detected for post-90 day resolutions for screening abnormalities in either the cervical cancer or breast cancer screening abnormality groups for any language group.	Limited to MA, English-English dyads included in language concordant group, did not confirm language concordance as occurring (patient navigators matched to patients so that they could speak the same language)
<b>Clark (2004)</b>	LC was positively associated with likelihood of agreement about exercise, but negatively associated with likelihood of agreement about medications. No differences were detected for other agreement outcomes (stress, diet, smoking, weight).	Convenience sample, limited to NM, English-English dyads included in language concordant group
<b>de Bocanegra (2011)</b>	LC was positively associated with the provision of reproductive health counseling. No differences were detected for sexually transmitted infection risk assessment or chlamydia testing.	Providers did not consistently document language needs of patients in medical charts (therefore could not extend analysis to Spanish-speaking patients who saw an English-speaking provider without an interpreter), cross-sectional study, limited to CA, did not confirm language concordance as occurring (provider asked to rate fluency)
<b>Detz (2014)</b>	LC was positively associated with more favorable ratings on most interpersonal aspects of care and one measure of diabetes self-care (foot care). No differences were found for ratings on discrimination or other aspects of diabetes self-care (healthy eating, self-monitoring, and medication adherence).	Diabetes self-care based on patient self-report, cross-sectional study with convenience sample, limited to CA, did not confirm language concordance as occurring (provider asked to rate fluency)
<b>Dunlap (2015)</b>	LC was positively associated with patient satisfaction scores and overall perceived quality of information transaction.	Convenience sample, limited to CA, very specific study setting (Hispanic Clinic for Pediatric Surgery) which may confound unique effects of language concordance, did not confirm language concordance as

		occurring (assumed through a visit through the Hispanic Clinic for Pediatric Surgery)
<b>Eamranond (2009)</b>	LC was positively associated with provision of diet and physical activity counseling. No differences were detected for smoking counseling.	Small sample size, effects could be due to differences in provider adherence to recommendations in counseling rather than language concordance, limited to MA, did not confirm language concordance as occurring (providers were natives of Latin America or Spain)
<b>Eamranond (2011)</b>	LC was negatively associated with colorectal cancer screens and tetanus vaccinations. No differences were detected for hyperlipidemia screens, diabetes screens, mammographies, breast cancer screens, or influenza vaccinations.	Small sample size, limited to MA, did not confirm language concordance as occurring (providers were natives of Latin America or Spain)
<b>Fernández (2017)</b>	LC was not associated with diabetes medication nonadherence.	Misclassification of LEP was possible because classification is based on administrative data for patient's language preference (i.e., patients could be proficient in English and could have carried out the visit in English), only captures adherence for newly prescribed medication and may not capture those who refused medication in the visit, cross-sectional study, limited to CA, did not confirm language concordance as occurring (provider asked to rate fluency)
<b>Fernandez (2011)</b>	LC was negatively associated with poor glycemic control (HbA1c >9%).	Cross-sectional study, limited to CA, English-English dyads included in language concordant group
<b>Gany (2007)</b>	LC was positively associated with satisfaction with provider communication/care (composite score). Language concordance was positively associated with satisfaction with most provider communication/care scores in subdomain analyses (e.g., clarity).	Limited to NY, English-English dyads included in language concordant group, did not confirm language concordance as occurring (provider asked to rate fluency)
<b>Goncalves (2013)</b>	LC was positively associated with one measure of receiving adequate treatment (> 8 outpatient psychotherapy visits or > 4 outpatient visits of which at least one was a psychopharmacological visit). No differences were detected for two other measures of adequate treatment (ER use among those with a visit for a psychiatric diagnosis, receipt of inpatient care for a psychiatric diagnosis).	Cross-sectional study, limited to MA, very specific study setting (Portuguese Mental Health Program) which may confound unique effects of language concordance, no explicit information given on how English-English dyads were handled, did not confirm language concordance as occurring (assumed through a visit to the Portuguese Mental Health Program)
<b>González (2010)</b>	LC was negatively associated with ratings of frustration, confusion, or perceptions of receiving lower quality of care due to an accent or English language ability. LC was positively associated with overall quality of care.	Outcomes based on last clinical encounter but language concordance determined by asking patient to consider what language their usual appointment visit is conducted in (last clinical encounter may not have been language concordant); cross-sectional

study, English-English dyads included in language concordant group

<b>Green (2005)</b>	LC was negatively associated with having unasked questions about their care or mental health. No differences were detected for three other measures of communication (enough time to explain reason for visit, how well provider explained things, given enough information about health) or overall visit rating.	Cross-sectional study with convenience sample
<b>Hacker (2012)</b>	LC was negatively associated with # of diabetes-related ER visits and overall # of diabetes-related hospitalizations/ER visits. No differences were detected for HbA1c, # of non-diabetes related ER visits, or # of diabetes-related hospitalizations.	Ratio of language concordant physicians to language group was different across languages, records were examined six months later for laboratory readings which may not be a sufficient amount of time to detect changes, limited to MA
<b>Jacobs (2007)</b>	LC was positively associated with patient satisfaction with providers and satisfaction with hospital stay and positively associated with # of ED visits after discharge. No differences were found for patient satisfaction with nursing, patient's adherence to follow-up appointment, patient's length of hospital stay, resource overutilization (provider-ordered specialty consults and provider-ordered radiology tests), or # of hospitalizations after discharge.	Limited to IL
<b>Jaramillo (2016)</b>	LC was positively associated with ratings of communication and # of patient-initiated questions. No differences were found for ratings of trust or perceived discrimination.	Convenience sample, limited to CA, very specific study setting (Hispanic Clinic for Pediatric Surgery) which may have confounded the unique effects of language concordance, English-English dyads included in language concordant group
<b>Jih (2015)</b>	LC was negatively associated with CRC screening among Asians but not Latinos. No differences were detected for mammography or influenza vaccination for Asians or Latinos.	Low response rate, use of preventive services based on patient self-report, patients asked to confirm seeing a provider in the past two years but study was unable to confirm if this was the usual source of care, cross-sectional study, limited to CA
<b>Lasser (2005)</b>	LC was negatively associated with missed appointments.	Cross-sectional study, limited to MA, English-English dyads included in language concordant group, did not confirm language concordance as occurring (provider asked to rate fluency or native speaking status, provider elected to not use an interpreter)
<b>Lee (2002)</b>	LC was positively associated with 4 of 8, and 7 or 8, satisfaction measures (compared to interpretation done through family members and ad-hoc interpreters, respectively). No differences were found	Low survey completion/return rate, limited to CO, English-English dyads included in language concordant group, no information on language concordance informant



	when LC was compared to interpretation done through telephone interpreters.	
<b>Leng (2011)</b>	No differences were detected for provision of referral for tuberculin test nor completion of tuberculin test.	Cross-sectional study, limited to NY, English-English dyads included in language concordant group
<b>Manson (1988)</b>	LC was negatively associated with missing appointments. No differences were detected for medication adherence.	Detected nontherapeutic serum levels (measure of medication nonadherence) may have been due to provider nonadherence to prescribing therapeutic levels or differences in drug bioavailability, limited to NY, small sample size, no information on language concordance informant
<b>Martin (2009)</b>	LC was positively associated with lack of difficulty contacting their usual source of care after-hours. No differences were detected for other primary care experiences (going to USC for new or ongoing health problems, going to USC preventive health care, going to USC for referrals, USC asks about other treatments, USC is difficult to contact by phone, USC has office hours, USC shows respect, USC asks patient on help on deciding on treatment, USC explains options to patient).	Cross-sectional study, English-English dyads included in language concordant group
<b>Mehler (2004)</b>	LC was positively associated with improvements in LDL, HbA1c, and diastolic blood pressure readings. No differences were detected for systolic blood pressure readings.	Limited to CO, small sample size, did not confirm language concordance as occurring (ethnically Russian patients matched with new internist from Russia), limited to single Russian internist
<b>Ngo-Metzger (2007)</b>	LC was positively associated with receipt of health education and ratings of interpersonal care. No differences were detected for ratings of satisfaction with provider.	Limited to those with a visit to primary care in the last month, cross-sectional study
<b>Parker (2017)</b>	LC was positively associated with glycemic control (HbA1c < 8%) and good LDL control (LDL < 100mg/dL). No differences were detected for poor glycemic control (HbA1c > 9%) or good blood pressure control (systolic blood pressure < 140 mm Hg).	Misclassification of Latinos with LEP possible, limited to CA
<b>Percac-Lima (2012)</b>	LC was positively associated with mammographies.	Limited to MA, small sample size, limited to a single patient navigator, did not confirm language concordance as occurring (Serbo-Croatian-speaking patients matched with a single Serbo-Croatian patient navigator from Bosnia), limited to a single Serbo-Croatian-speaking provider



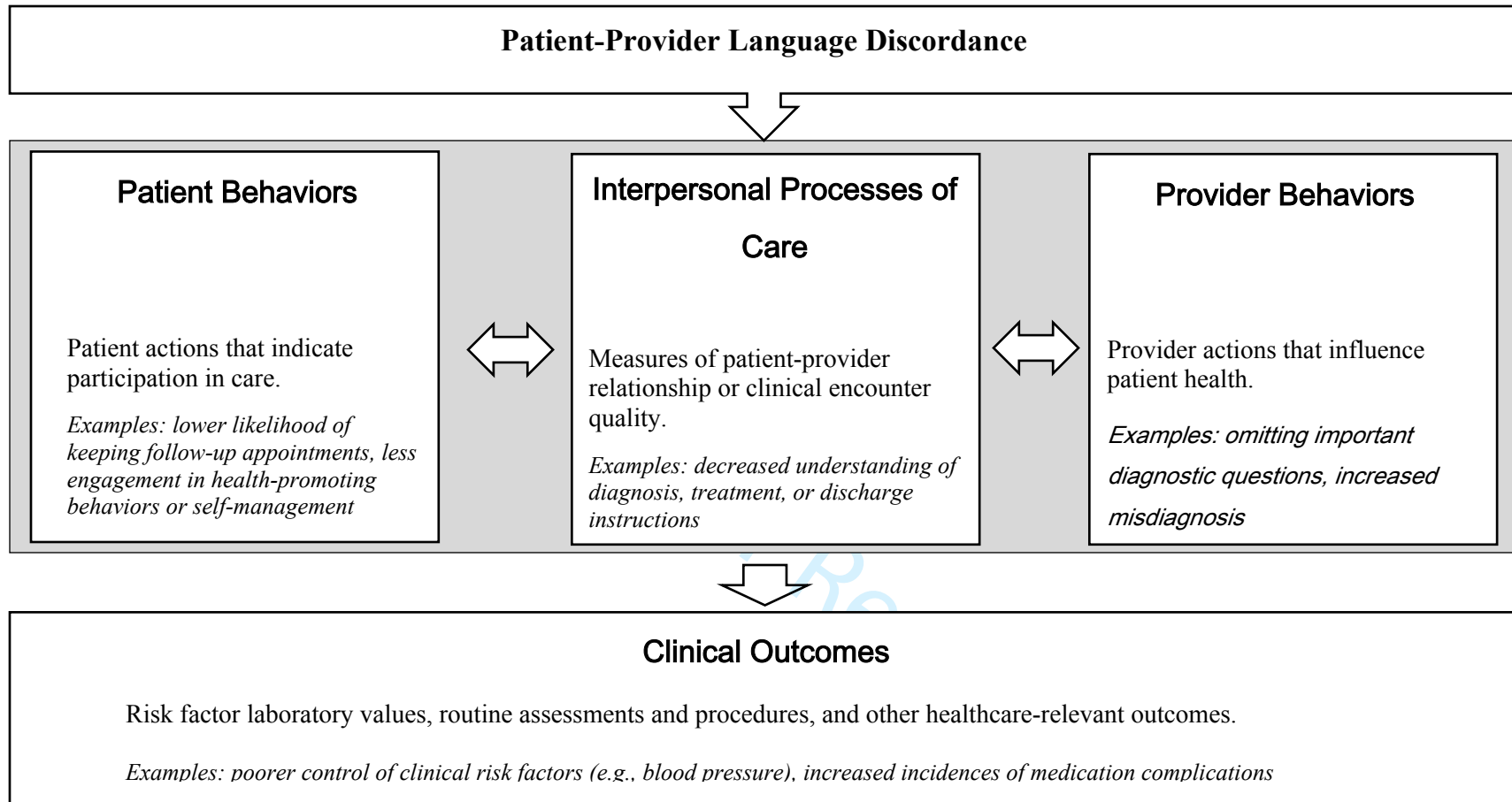
<b>Pérez-Stable (1997)</b>	LC was positively associated with physical and psychological functioning and well-being (overall domains) and better health perceptions. LC was negatively associated with pain (overall domain). No differences were detected for certain subdomains or for patient satisfaction.	Low survey completion rate, retrospective review of medical records is a suboptimal method of measuring health care utilization in an open system, Medical Outcomes Study measures not validated for use in a Spanish-speaking sample, cross-sectional study, limited to CA, English-English dyads included in language concordant group
<b>Rostanski (2016)</b>	No differences were detected for stroke mimic treatment or time to stroke mimic treatment.	Misclassification of stroke mimics possible, limited to NY, small sample size, English-English dyads included in language concordant group, did not confirm language concordance as occurring (provider asked to rate fluency)
<b>Schenker (2010)</b>	LC was negatively associated with 3 of 10 ratings of poor provider communication/care (provider not understanding problems with carrying out treatment regimen, lack of confidence in provider, perception of poor treatment due to language). No differences were detected for 7 other measurements.	Cross-sectional study, limited to CA
<b>Sentell (2013)</b>	No differences were detected for completed colorectal cancer screens.	Cancer screening history based on patient self-report, sample with LEP small, cross-sectional study, limited to CA, did not report provider type
<b>Traylor (2010)</b>	LC was positively associated with adherence to all CVD medications (composite score). No differences were detected for individual analyses of medication adherence (adherence to diabetes, cholesterol, or hypertension medications).	Cross-sectional study, limited to CA, no explicit information given on how English-English dyads were handled, did not confirm language concordance as occurring (provider asked to rate fluency)
<b>Tsoh (2016)</b>	No differences were detected for self-rated health.	Cross-sectional study, limited to CA
<b>Villalobos (2016)</b>	No differences were detected for therapeutic alliance.	Cross-sectional study, limited to AR, did not provide information on language concordance informer (providers were considered bilingual but no information provided for how that was determined)
<b>Walsh (2009)</b>	No differences were detected for colorectal cancer screening completions.	Medical comprehension and adverse medication events based on patient self-report, cross-sectional study, limited to CA, no explicit information given on how English-English dyads were handled, no information on language concordance informant,
<b>Wilson (2005)</b>	LC was negatively associated with having a problem understanding a medical situation because it was not explained in the patient's language.	Cross-sectional study, limited to CA

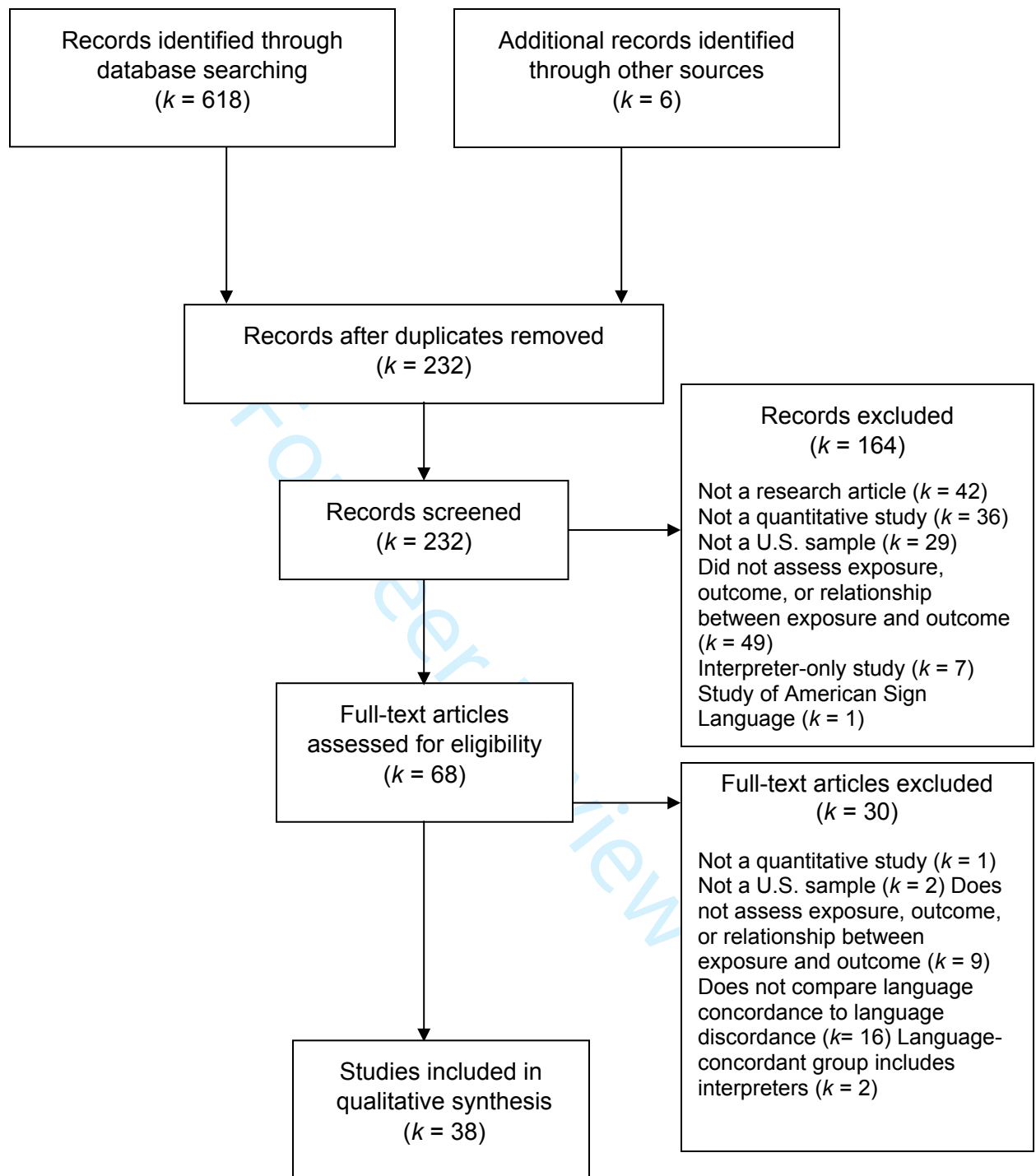
*Note.* LC = language concordance; LD-I = language discordant, including interpreter use; LD = language discordance; CA = California; MA = Massachusetts; NM = New Mexico; NY = New York; TX = Texas; WA = Washington; IL = Illinois; CO = Colorado; AR = Arkansas; NR = not reported; ED = emergency department; ER = emergency room.

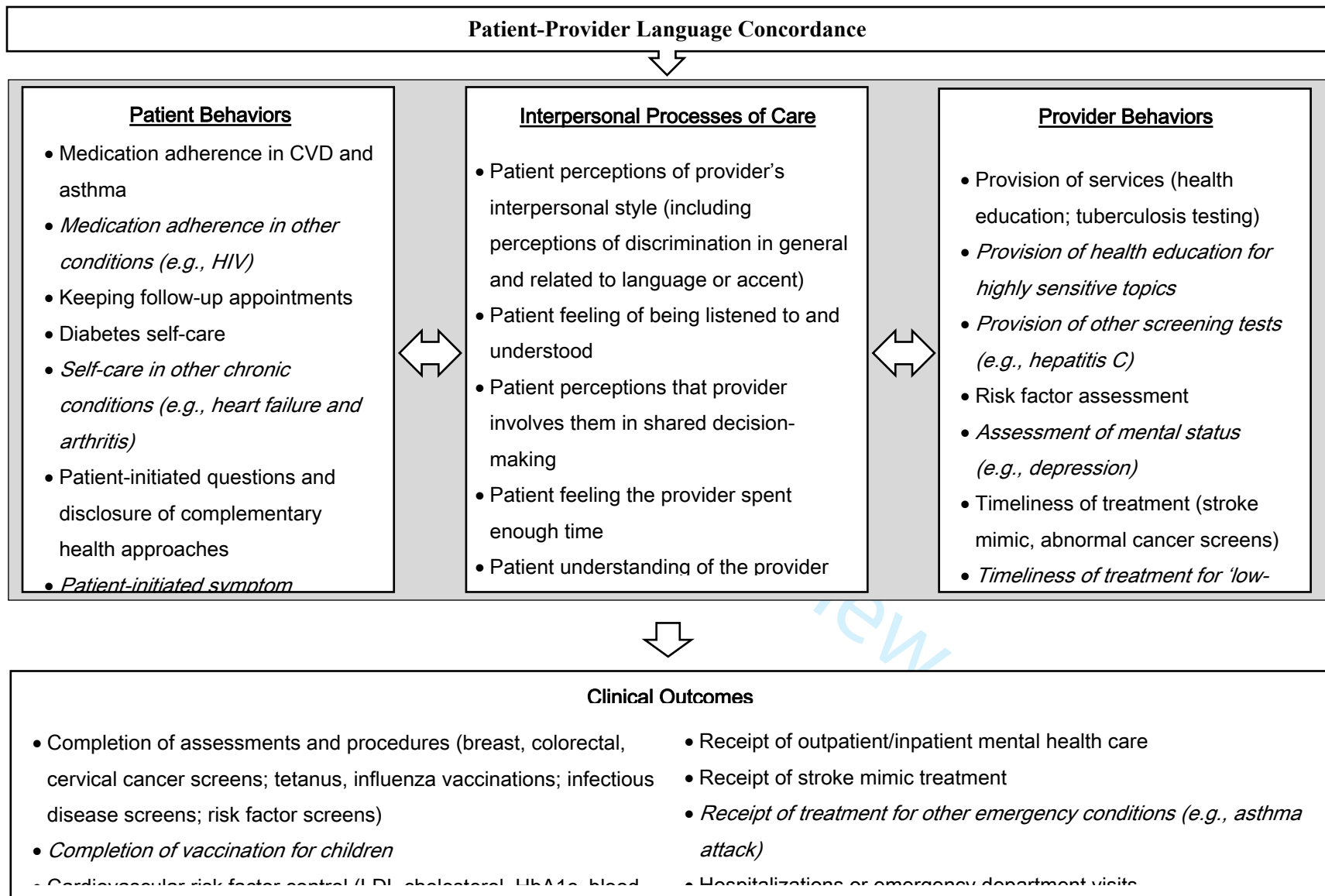
Table 4. Summary of Findings Regarding Associations of Patient-Provider Language Concordance with Patient Behaviors, Provider Behaviors, Interpersonal Processes of Care, and Clinical Outcomes

	Association in Favor of LC	Association Not in Favor of LC	No Association	Total
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i>
<b>Patient behaviors (<i>k</i> = 9)<sup>a</sup></b>	<b>6 (26.1)</b>	<b>0 (0)</b>	<b>17 (73.9)</b>	<b>23</b>
Medication adherence ( <i>k</i> = 4)	1	0	10	11
Other adherence ( <i>k</i> = 4)	3	0	3	6
Other patient behaviors ( <i>k</i> = 3)	2	0	4	6
<b>Provider behaviors (<i>k</i> = 8)</b>	<b>8 (27.6)</b>	<b>0 (0)</b>	<b>21 (72.4)</b>	<b>29</b>
Timeliness of treatment ( <i>k</i> = 2)	2	0	7	9
Risk factor assessment ( <i>k</i> = 2)	1	0	3	4
Provision of services ( <i>k</i> = 5)	5	0	9	14
Overutilization of resources ( <i>k</i> = 1)	0	0	2	2
<b>Interpersonal processes of care (<i>k</i> = 17)</b>	<b>49 (50.5)</b>	<b>1 (1)</b>	<b>47 (48.5)</b>	<b>97</b>
Interpersonal style ( <i>k</i> = 11)	16	0	12	28
Communication/information quality ( <i>k</i> = 10)	12	0	6	18
Satisfaction ( <i>k</i> = 8)	7	0	7	14
Listening skills/feeling understood ( <i>k</i> = 4)	5	0	3	8
Shared decision-making ( <i>k</i> = 4)	1	0	4	5
Spending enough time with patient ( <i>k</i> = 3)	1	0	3	4
Other interpersonal processes of care ( <i>k</i> = 6)	7	1	12	20
<b>Clinical outcomes (<i>k</i> = 17)</b>	<b>16 (29.6)</b>	<b>4 (7.4)</b>	<b>34 (63)</b>	<b>54</b>
Assessments and procedures ( <i>k</i> = 8)	1	3	19	23
Risk factor control ( <i>k</i> = 4)	6	0	4	10
ED visit/hospitalization ( <i>k</i> = 3)	1	1	4	6
Other clinical outcomes ( <i>k</i> = 4)	8	0	7	15
<b>All outcomes</b>	<b>79 (38.9)</b>	<b>5 (2.5)</b>	<b>119 (58.6)</b>	<b>203</b>

Note. Total number of studies (*k*) = 38. LC = language concordance; ED = emergency department. <sup>a</sup>Number of studies examining subdomains (e.g., medication adherence) do not sum to the total number of studies for the global domain (e.g., patient behaviors) because several studies examined more than one subdomain (e.g., a study examining medication adherence and other adherence would be counted twice).







### Figure Captions

1. **Figure 1.** Guiding conceptual framework adapted from Kilbourne, Switzer, Hyman, Crowley-Matoka, and Fine (2006) illustrating how patient-provider language concordance may affect patient behaviors, provider behaviors, interpersonal processes of care, and clinical outcomes, potentially contributing to poorer health. The conceptual framework guides categorization of health outcomes for this review.
2. **Figure 2.** Flow chart of study selection process.
3. **Figure 3.** Evidence map illustrating the state of the literature examining patient-provider language concordance and patient behaviors, provider behaviors, interpersonal processes of care, and clinical outcomes by sampling topics included in this review. Topics in *italics* are gaps in knowledge for future research.

Supplemental Table 1. *Summary of Findings Regarding Associations of Patient-Provider Language Concordance with Patient Behaviors, Provider Behaviors, Interpersonal Processes of Care, and Clinical Outcomes from Subanalysis of 90 Associations Excluding English-English Dyads*

	Association in Favor of LC	Association Not in Favor of LC	No Association	Total
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i>
<b>Patient behaviors (<i>k</i> = 5)<sup>a</sup></b>	<b>2 (16.6)</b>	<b>0 (0)</b>	<b>10 (83.3)</b>	<b>12</b>
Medication adherence ( <i>k</i> = 3)	1	0	6	7
Other adherence ( <i>k</i> = 3)	1	0	4	5
<b>Provider behaviors (<i>k</i> = 4)</b>	<b>6 (46.2)</b>	<b>0 (0)</b>	<b>7 (53.8)</b>	<b>13</b>
Risk factor assessment ( <i>k</i> = 1)	1	0	1	2
Provision of services ( <i>k</i> = 3)	5	0	4	9
Overutilization of resources ( <i>k</i> = 1)	0	0	2	2
<b>Interpersonal processes of care (<i>k</i> = 8)</b>	<b>16 (51.6)</b>	<b>0 (0)</b>	<b>15 (48.4)</b>	<b>31</b>
Interpersonal style ( <i>k</i> = 3)	4	0	4	8
Communication/information quality ( <i>k</i> = 5)	7	0	3	10
Satisfaction ( <i>k</i> = 4)	3	0	3	6
Listening skills/feeling understood ( <i>k</i> = 1)	1	0	1	2
Shared decision-making ( <i>k</i> = 2)	1	0	1	2
Spending enough time with patient ( <i>k</i> = 2)	0	0	2	2
Other interpersonal processes of care ( <i>k</i> = 1)	0	0	1	1
<b>Clinical outcomes (<i>k</i> = 10)</b>	<b>7 (20.6)</b>	<b>4 (11.8)</b>	<b>23 (67.6)</b>	<b>34</b>
Assessments and procedures ( <i>k</i> = 5)	1	3	14	18
Risk factor control ( <i>k</i> = 3)	5	0	4	9
ED visit/hospitalization ( <i>k</i> = 2)	1	1	3	5
Other clinical outcomes ( <i>k</i> = 2)	0	0	2	2
<b>All outcomes</b>	<b>31 (34.4)</b>	<b>4 (4.4)</b>	<b>55 (61.1)</b>	<b>90</b>

Note. Total number of studies (*k*) = 20. LC = language concordance; ED = emergency department. <sup>a</sup>Number of studies examining subdomains (e.g., medication adherence) do not sum to the total number of studies for the global domain (e.g., patient behaviors) because several studies examined more than one subdomain (e.g., a study examining medication adherence and other adherence would be counted twice).