# Screening Older Adults for Depression in Primary Care

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Abstract

**Background and Purpose**

Depression in older adults is a significant problem that often goes undetected and untreated in primary care. The U.S. Preventive Services Task Force recommends screening adults for depression in primary care to increase detection, so it can be adequately managed. Despite this recommendation, screening rates in primary care are low. The purpose of this project was to implement a screening intervention and examine the effect of screening on the treatment of depression in older adults.

**Methods**

The screening intervention was implemented as an evidence-based project in a small primary care practice. Consenting adults ≥ 65 years of age were screened with the Patient Health Questionnaire-9 (PHQ-9). Research indicates the PHQ-9 is valid and reliable for older adults. A post-screening chart audit was conducted to collect data and analyze the outcome of screening related to treatment.

**Conclusions**

A total of 38 participants were screened. Five (13.2%) participants had a positive screening, two received treatment during the follow up period. The number of participants who were treated after a positive screening was significant (p= .040).

**Implications for Practice**

Screening can increase detection and treatment of depression and reduce the associated illness burden in the older adult population.

*Keywords:* depression screening, older adults, treatment, primary care

Screening older adults for depression in primary care

Since the turn of the century, depression has garnered considerable attention in health care. Recognition of the negative impact depression has on individuals and the health system prompted researchers and experts to explore strategies for mitigating the problem. These efforts, and research highlighting the prevalence of unrecognized depression among adults managed by general practitioners, led to a focus on depression in the primary care setting.

## Problem Statement

Depression is a well-known problem among older adults in the primary care. Despite awareness of this problem, a significant portion of this population remains undiagnosed. In the United States, approximately 7 million adults over age 65 are affected by depression (Centers for Disease Control, 2012). Per the Centers for Medicare and Medicaid Services (CMS) (2011), up to 25% of older adults with comorbid medical conditions experience depression. Meanwhile, an estimated 15.1% of Arizona seniors have depression (United Health Foundation, 2016).

Research indicates Primary Care Providers (PCP) detect 40% to 50% of depression cases among older adults (Park & Unutzer, 2011). Failure to recognize depression in primary care is significant because older adults tend to receive treatment in this setting. Up to two-thirds of older adults treated for depression receive the treatment from their primary care provider (O'Conner, Whitlock, Beil & Gaynes, 2009). Thus, failure to detect is a significant barrier to treatment.

Undiagnosed and untreated depression associates with significant individual and societal burden. Personal consequences of depression include suffering, diminished quality of life, and increased risk of suicide (American Medical Association, 2015). The suicide rate among

Arizona residents over 65 was 22.7 per 100,000 residents in 2016 compared to 16 per 100,000 for this age group in the greater U.S. (United Health Foundation, 2016).

Societal implications of depression originate from the burden imposed on the greater health system. Elderly patients with depression and co-morbid chronic conditions have significantly higher health care costs compared to those without depression due to increased utilization including frequent hospitalization, emergency department visits, and doctor visits (Centers for Disease Control, 2012). Depression also complicates the treatment and outcome of co-morbid medical conditions. The Centers for Disease Control (CDC) estimates the economic cost of depression from lost productivity, health expenditures, and suicide exceeded 200 billion dollars in 2010 (CDC, 2016).

In the last several years, awareness of the depression burden led to a shift in public health policy toward a focus on recognizing depression in primary care. In 2002, the U.S. Preventive Service Task Force (USPSTF) recommended depression screening for adults in primary care (USPSTF, 2002). The USPSTF recommendation influenced the 2011 Medicare decision to pay for annual depression screenings in primary care (CMS, 2011). Clinical practice guidelines from the Agency for Healthcare Research and Quality (AHRQ) recommend routine depression screening for all adults in primary care (AHRQ, 2016).

## Purpose

As the major entry point for health care services, primary care providers (PCP) are in a unique position to detect and treat depression in the older adult population. The purpose of this paper is to discuss the background and significance of the problem, the strategy used to search the literature, synthesize the evidence, and discuss an evidence-based project that implemented the evidence into practice.

## Background and Significance

Screening older adults with a standardized age-appropriate instrument can help PCPs detect depression in this population. In a systematic review, Watson and Pignone (2003) examined the accuracy of depression screening instruments in the older adult primary care population and identified several instruments with good sensitivity and specificity including the Geriatric Depression Scale (GDS), Center for Epidemiological Studies Depression Scale, and the SelfCARE(D). This review influenced the original USPSTF recommendation.

O'Conner, Whitlock, Beil, and Gaynes (2009) expanded upon this research by conducting a systematic review to aid the USPSTF in updating its original 2002 screening recommendation. The authors concluded screening helps identify depression but screening alone does not improve outcomes (O'Conner, Whitlock, Beil & Gaynes, 2009). Instead, screening as part of a greater approach that includes additional support and treatment is beneficial (O'Conner, Whitlock, Beil & Gaynes, 2009). These findings influenced the revised USPSTF recommendations in 2009.

In a recent systematic review, O'Conner et al. (2016) examined evidence regarding benefits and harms of depression screening in the adult population to provide a comprehensive updated review for the USPSTF. The rationale for routine screening is to identify undiagnosed depression and reduce the amount of time between depression onset, and initiation of treatment (O'Conner et al., 2016). The authors concluded depression screening programs increase the likelihood of remission or reduction of depression symptoms in response to treatment (O'Conner et al., 2016).

An increase in diagnosis and treatment from screening is significant considering the prolonged time it typically takes people to receive treatment after onset of symptoms. According to Pence, O'Donnell, and Gaynes (2012), the median time from symptom onset to depression treatment is eight years. Meanwhile, O'Conner et al (2016) report the average onset to treatment time is four years.

Evidence also indicates screening and subsequent treatment of depression can reduce suicide. A systematic review of suicide prevention programs reveals depression screening and awareness programs correlate with reduced risk of suicide in older adults (Lapierre et al., 2011). Furthermore, screening and treatment interventions can reduce non-suicide related mortality. Gallo et al. (2013) found that older adults who were screened, and received depression treatment interventions, had a lower mortality risk compared to those receiving usual care; mortality risk among those in the depression treatment group was similar to people without depression. According to the USPSTF (2015), both medication and psychotherapy can increase rates of remission from depression.

A common theme in the literature regarding depression screening is the relation between screening and treatment. Specifically, the goal of screening in primary care is to detect depression so it can be treated. Depression is treatable in up to 80% of cases (CDC, 2012).

Despite evidence supporting depression screening in primary care, expert recommendation, and initiatives from public health authorities, it appears screening is not yet standard practice. Data from the National Ambulatory Medical Care Survey from 2005 to 2010 reveals an average annual screening rate of 1.8% in primary care (McGoey, Huang & Palmes, 2013). Meanwhile, Maimone and Mahartta (2015) analyzed a random sample of 500 patients and identified a slightly higher screening rate of 14.6% (Maimone and Mahartta, 2015). While

estimates of screening rates may vary, the low rates indicate screening practices are under-utilized in primary care.

The results of this inquiry, indicating screening helps detect depression and can result in subsequent treatment, leads to the following clinically relevant PICOT question: "In older adult primary care patients, how does depression screening, compared to no screening, affect treatment over a three-month period?"

## Search Strategy

An extensive search of research databases was conducted to identify evidence pertinent to the clinical question. This entailed an exhaustive search of three databases: PsycINFO, PubMED, and CINAHL. Each database search entailed use of keywords and Boolean connectors. The keywords used are *depression screening, older adults* or *elderly, primary care* or *general practice,* and *treatment* or *referral.* Title and abstracts of results from each database were reviewed and relevant articles saved for further appraisal. A total of 28 articles were identified from the search. Each study was critically appraised according to the inclusion and exclusion criteria. Ten final studies relevant to the clinical question were included in an evaluation table (Appendix A).

## Critical Appraisal and Synthesis of Evidence

Studies contained in this review are generally high quality studies with varying levels of evidence. Six studies represent level III evidence or higher, and the remainder are level IV evidence. All studies are quantitative and include depression screening as a component, either alone, or as an integral part of a broader intervention. There is significant heterogeneity among interventions across studies ranging from screening only, to screening with feedback, and intensive support. Outcome variables for the level I

through III studies include depression response or symptom reduction, remission, and mortality. Meanwhile, lower level studies examined screening rates and correlations between screening, diagnosis, treatment, and outcomes.

Overall, the studies reported an adequate amount of demographic data, employed appropriate methods, and had a clearly-defined research purpose. All but three studies had a greater number of female than male participants. Four studies focused exclusively on older adults while the remainder contained the general adult population including older adults.

Evidence from the six level I through III studies reveal varying degrees of support for depression screening. The effect of screening is weakest when used alone and gets stronger when combined with additional support including treatment. This finding was consistent for outcome variables across all the higher-level studies. Five of the six studies report screening interventions improved depression symptoms, four report increased rates of remission, in three there was a reduction in suicidal ideation, and two report a reduction in depression related mortality risk. Studies included in the systematic reviews were well designed RCT's and cohort studies with adequate follow-up time, randomization, blinding and concealment, acceptable attrition rates, and homogenous sample characteristics. However, some studies included in the systematic reviews were underpowered with wide confidence intervals and failed to find even large improvements in depressive symptoms significant. In contrast, findings from adequately-powered studies were significant and more precise with narrow confidence intervals.

Results from the level IV studies were consistent for similar outcomes. Screening rates were low across all studies. Three studies showed higher rates of diagnosis from screening and in two of these studies, screening was associated with initiating treatment. These studies were retrospective, had large sample sizes, utilized data from electronic health records, and employed

appropriate measures including regression and variable analysis to limit confounding factors and bias. The PHQ-9 and HAM-d were the most commonly used screening instruments across studies.

## Conclusion from the Evidence

Screening older adults for depression in primary care increases detection of the illness and can lead to diagnosis and subsequent treatment. When screening results in diagnosis and treatment, it improves outcomes by reducing symptoms, increasing rates of remission, and lowering the risk of depression related mortality.

## Project Aims

The purpose of this evidence-based project is twofold: implement the USPSTF screening recommendation to screen older adults for depression in primary care and examine the effect of screening on treatment.

## EBP Model for Guiding Project

The Stetler Model of Evidence-Based Practice provides a guide for implementing the depression screening intervention. The model consists of distinct phases that guide a change in practice: identifying a need for change, assessing the evidence, making decisions about the evidence, incorporating the evidence into a plan for use and implementing the plan, and evaluating whether the goals related to implementation were met (Melnyk & Fineout-Overholt, 2015). The model can be used to implement change by an individual, group, or entire organization (Stetler, 2001). The flexibility of the Stetler Model makes it a good fit for implementing a depression screening in a small primary care practice.

# Methods

## Human Subjects Protection

Approval for this project was granted by the Arizona State University Institutional Review Board and the project site. Participation in the project was voluntary and no personally identifying data was collected.

## Setting and Participants

The project was implemented at a small urban primary care practice in Arizona. Patients were eligible to participate if they were ≥ 65 years of age, English speaking, able to give consent, and had an appointment on the day of screening. Patients under age 65, unable to give consent, and non-English speaking were excluded.

## Design and Procedures

The project contained two phases: a depression screening intervention and a follow up chart audit. During the screening phase, eligible patients were given a cover letter explaining the purpose of the project and time was taken to answer questions. Consenting patients were screened with the PHQ-9 and results communicated to both the patient and the PCP. The PCP documented the screening result in the electronic medical record (EMR).

Three months after the screening intervention, in February 2018, the chart audit was completed. To facilitate the audit, the EMR was utilized to query all patients who had an appointment on the dates of screening. A documented screening result from the date of screening connected the patient to the project.

## Measures

The PHQ-9 was derived from the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire and designed for use in primary care settings (Kroenke, Spitzer &

Williams, 2001). Items on the PHQ-9 are based on the diagnostic criteria for depression from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV); it can be used as an initial screening tool and to assess the ongoing severity of depression (Kroenke, Spitzer & Williams, 2001). The instrument demonstrates validity and reliability when used on older adults with a sensitivity of 88% and specificity of 80% (Phelan et al, 2010). A score ≥10 is considered a positive screening (Kroenke, Spitzer & Williams, 2001). Thus, for project purposes, this was the score used to determine a positive screening.

**Data Collection and Analysis**

Data collection occurred during the chart audit. Relevant data was transferred onto a data collection spreadsheet in de-identified form to protect the privacy of participants. Specific data included demographic information such as age and gender, screening result, diagnosis status before and after screening, and treatment status before and after screening.

Descriptive statistics were used to describe the sample and outcome variables. A two-tailed test was used to analyze the data and the critical value set at $p<.05$. For evaluation purposes, treatment was defined as either initiating a new treatment or changing an existing treatment after the screening. SPSS was used to store and manage the data (cite SPSS).

## Results

The sample ($N$=38) consisted of 23 females (60.5%) and 15 males (39.5%) participants. Mean age was 79.7 (SD=7.8), the minimum age was 66 and maximum age in the 90 range. The maximum score on the PHQ-9 was 16 with a mean score of 3.4 (SD=4.4) among all participants. Five participants (13.2%) screened positive for

depression and 32 (86.8%) were negative. Twelve (31.6%) participants had an existing diagnosis of depression. One participant was lost to follow up because there was no documented screening result, and thus, no way to connect the participant to the project.

Of the five who screened positive, two received treatment after the screening. Due to the small sample size, Fisher's exact test was used to test the data for statistical significance. At an alpha of 0.05, the proportion of participants who received treatment after screening is significant ($p$=.040). Participants were more likely to get treatment after a positive screening ($OR$= 21.3, 95% CI [1.47-310]).

## Discussion

The purpose of this project was to implement an evidence-based depression screening and examine how screening effects treatment. Results of the analysis indicate there was a small, but statistically significant, increase in treatment after the screening intervention. This finding indicates screening can be an effective way to increase diagnosis and treatment of depression in older adults.

Several themes emerged from the data analysis. First, the prevalence of depression among participants is similar to the greater population. An estimated 15% of Arizona seniors suffer from depression (United Health Foundation, 2016). In comparison, 13.8% of participants screened positive for depression. Next, there was a greater number of female than male participants. This is a phenomenon found in most of the studies reviewed from the literature.

Another theme to emerge from the data is that screening serves multiple purposes in the management of depression. Kroenke (2012) reports the PHQ-9 is a multipurpose instrument ideal for screening for undetected depression, gauging the severity of depression, and monitoring the effectiveness of treatment. This concept is evident when examining the screening results.

Four of the 5 participants with a positive screening had existing diagnosis and treatment. For these individuals, screening positive suggested their treatment was not effective. Meanwhile, 8 participants with a negative screening had an existing diagnosis and treatment. Some of these participants scored zero on the PHQ-9 which indicates remission of symptoms. In these cases, the negative screening reflects adequate treatment.

**Implications**

The findings of this project support the use of screening in primary care to detect depression and increase the number of older adults who receive treatment. These findings add to the existing body of evidence supporting the USPSTF screening recommendation. Providers can screen patients with an age appropriate instrument like the PHQ-9 to detect depression, gauge the severity of known depression, and evaluate the effectiveness of treatment.

It is important to note that this study was conducted over a short period of time and focused solely on the relationship between screening and treatment. As a result, it was not possible to evaluate the adequacy of treatment and follow up. This is important because there is evidence that depression is often inadequately treated in primary care. According to Park and Unutzer (2011), most older adults treated for depression receive the treatment from their PCP but only around 20% are adequately treated. Consequently, future studies should examine the adequacy of treatment over time. In addition, larger studies are needed to better estimate the effect of screening.

## Limitations

A major limitation of this study is the small sample size. This makes the estimated effect of screening less precise and is evident in the wide confidence interval. A small sample size also makes the findings less generalizable to the greater population. Therefore, the results should be interpreted within the context of these limitations.

## Conclusion

Despite the limitations of this project, the results suggest screening has an important role in addressing depression. Screening older adults for depression can increase detection of the illness and lead to diagnosis and treatment. Adequate treatment can reduce the burden depression imposes on individuals by improving quality of life and minimizing its adverse effect on co-morbid medical conditions. In addition, a higher number of older adults treated for depression may reduce the impact on society associated with increased health costs from higher utilization of health services.

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Appendix A

Table 1

*Evaluation Table*

| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
|---|---|---|---|---|---|---|---|---|
| Akincigil & Matthews (2017). National rates and patterns of depression screening in primary care: Results from 2012 and 2013.<br><br>Funded by AHRQ<br><br>No conflicts of interest or bias noted<br><br>USA | Inferred- Diffusions of Innovations Framework | Cross-sectional secondary analysis<br><br>**Purpose:** examine rates and patterns of DS among PCP visits and identify associations with initiatives such as EHR adoption through meaningful use or quality initiatives. | n= 33,653 patient-physician encounters<br>F>M<br><br>**IC:** Adults without existing depression; PC visit<br><br>**EC:** Under age 18; prior depression dx | IV1- gender<br>IV2- EHR use<br>IV3-participation meaningful use or federal value program<br>IV4- quality reimbursement<br><br>DV-DS | NR | Stata statistical software, Pearson Chi-square tests and Multi-variate logistic regression CI=95% | DS rate= 4.2%<br>47% of screened got new dx of MDD<br><br>EHR use- 5% DS (AOR 1.81, p= .001)<br><br>Gender-<br>M: 3.8%<br>: 4.4% (AOR 1.36, p= .110)<br><br>Quality reimbursement-NS (AOR 1.09, p=.087) | **Level IV**<br><br>**Strengths:** Large sample size, general description of screening practices, appropriate methods<br><br>**Weaknesses:** Assumed screening occurred if new dx of MDD, retrospective |

Key: **AHRQ-** Agency for Healthcare Research and Quality; **AOR-** adjusted odds ratio; **ARR-** absolute risk reduction; **BDI-** Beck Depression Inventory; **CG-** Control Group; **CI-** confidence interval; **CIDI-** Composite International Diagnosis Interview **DS-** depression screening; **DV**-dependent variable; **dx-** diagnosis; **EC-** exclusion criteria; **EHR-** electronic health record; **f/u-** follow-up; **GDS-** Geriatric Depression Scale; **HAM-d-** Hamilton Depression Scale; **IC-** inclusion criteria; **IV**- independent variable; **IG-** intervention group; **IRR-** incident rate ratio; **MA-** meta-analysis; **MDD**- major depressive disorder; **MH-** mental health; **MMSE-** mini mental status exam; **N**-number of studies; **n**- number of participants; **NAMCS-** National Ambulatory Medical Care Survey; **NNT-** number needed to treat; **OR-** odds ratio; **PC-** primary care; **PHQ-9-** Patient Health Questionnaire-9; **PCP**-primary care provider; **RI-** relative incidence; **RS-** random sampling; **RR-** relative risk; **RRR-** relative risk reduction; **SR-**systematic review; **tx-** treatment; **SRDS-** Zung Self-Rated Depression Scale; **USPSTF-** U.S. Preventive Services Task Force

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **Conclusion:** Explanatory significance; screening rates are low. Quality reimbursement not a predictor of screening |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| Gallo et al. (2013)<br><br>Funding: NIMH<br><br>Bias/Conflicts: none<br><br>USA | Inferred-Health Prevention framework | RCT-long-term f/u of PROSPECT study / quantitative<br><br>**Purpose:** Assess whether the increased mortality risk among patients with MDD can be reduced to the risk of those without MDD | n= 1226<br><br>Setting: 20 PC practices in 3 cities<br><br>Age stratified RS<br><br>**IC:** age ≥ 60; MMSE score >17; English speaking; CES-D score > 20 | IV1-MDD in IG<br>IV2-No MDD in IG<br>IV3-MDD in CG<br>DV-mortality risk (risk of death of patients with MDD in IG vs risk in those with MDD in CG) | CES-D<br>HAM-D<br><br>CES-D tested in older adults: sensitivity 83%, specificity 78%<br><br>Unknown if HAM-D tested in older adults | SAS 9.1 and Stata 12.0 Cox proportional hazards regression; Kaplan & Meier method<br><br>CI= 95% | Hazard ratio for MDD in CG 1.90 (95% CI: 1.57-2.31)<br><br>Hazard ratio for MDD in IG 1.09 (95% CI: 0.83-1.44)<br><br>Hazard ratio for MDD in IG compared to MDD in CG 0.76 (95% CI: 0.57-1.00) | **Level II**<br><br>**Strengths:** Large sample size, long f/u period, RCT<br><br>**Weaknesses:** Interventions used in IG may not be feasible or cost effective in general settings<br><br>**Conclusions:** Findings indicate treating MDD in |

Key: **AHRQ-** Agency for Healthcare Research and Quality; **AOR-** adjusted odds ratio; **ARR-** absolute risk reduction; **BDI-** Beck Depression Inventory; **CG-** Control Group; **CI-** confidence interval; **CIDI-** Composite International Diagnosis Interview **DS-** depression screening; **DV**-dependent variable; **dx-** diagnosis; **EC-** exclusion criteria; **EHR-** electronic health record; **f/u-** follow-up; **GDS-** Geriatric Depression Scale; **HAM-d-** Hamilton Depression Scale; **IC-** inclusion criteria; **IV**- independent variable; **IG-** intervention group; **IRR-** incident rate ratio; **MA-** meta-analysis; **MDD**- major depressive disorder; **MH-** mental health; **MMSE-** mini mental status exam; **N**-number of studies; **n**- number of participants; **NAMCS-** National Ambulatory Medical Care Survey; **NNT-** number needed to treat; **OR-** odds ratio; **PC-** primary care; **PHQ-9-** Patient Health Questionnaire-9; **PCP**-primary care provider; **RI-** relative incidence; **RS-** random sampling; **RR-** relative risk; **RRR-** relative risk reduction; **SR-**systematic review; **tx-** treatment; **SRDS-** Zung Self-Rated Depression Scale; **USPSTF-** U.S. Preventive Services Task Force

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | | older adults reduces risk of mortality/morbidity. Aligns with other studies that treating MDD has substantial benefits. |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| Burton (2012). Diagnosis and treatment of depression following routine screening in patients with coronary heart disease or diabetes: a database cohort study.<br><br>Funding: National Health Service of Scotland | Quality and Outcomes Framework | RCS / quantitative<br><br>**Purpose:** Evaluated patient records to examine relation between DS and dx/tx in the month following DS in patients with chronic illness | n=67,358<br>Data from General Practice Administration System in UK<br>F>M<br><br>Setting:<br>237 PC practices<br><br>**IC:**<br>Dx of coronary heart disease or diabetes and DS during study period | IV-DS<br><br>DV1- dx within 4 weeks<br>DV2-tx within 4 weeks | PHQ-9<br><br>PHQ-9 tested in older adults: sensitivity 88%, specificity 80% | Self-control, case-series method<br><br>Relative incidence<br><br>95% CI | **DV1:**<br>RI 3.03 (95% CI, 2.44-3.78)<br><br>**DV2:**<br>RI 1.78 (95% CI, 1.54-2.05) | **Level IV**<br><br>**Strengths:**<br>Large sample size, case-control design reduces confounding factors related to differences between subjects<br><br>**Weaknesses:**<br>Lower level of evidence, retrospective study, did not include those with |

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| Bias/ Conflicts of interest: none identified<br><br>United Kingdom | | | **EC:**<br>DS, dx, and tx on same day | | | | | DS, dx, and tx on same day<br><br>**Conclusions:** Findings indicate there was higher rate of dx and tx after screening. Screening is effective in people with chronic illness |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| Lapierre et al. (2011). Systematic review of elderly suicide prevention programs.<br><br>Funding: not disclosed<br><br>Bias/Conflicts: none noted | Inferred -Health Prevention Framework | SR / quantitative<br><br>**Purpose:** examine results of interventions for suicidal elderly persons to identify successful strategies<br><br>**Method:** Searched 5 | N=19 studies<br>n= 31,505<br><br>**Setting:** Multi-national<br><br>**IC:** Studies with empirical evaluation of a suicide intervention or prevention | IV1- DS<br>IV2- tx<br>IV3- education interventions<br>IV3- social isolation reduction<br>DV1-suicidal ideation<br>DV2-depression symptoms | Specific instruments NR | Qualitative synthesis | **DV1:**<br>3/4 studies showed significant reduction in SI ($p < 0.05$)<br>1 study showed NS reduction in SI<br><br>**DV2:**<br>3/4 studies showed | **Level I**<br><br>**Strengths:**<br><br>Large sample size, SR, focus on elderly<br><br>**Weaknesses:**<br><br>No MA due to heterogeneity of interventions in |

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| Country: International network of researchers | | databases from 1966-2009 | program; age ≥60; peer reviewed | | | | significant reduction in symptoms; 1 study showed no difference between IG and CG | studies, some interventions may not be feasible<br><br>**Conclusion:**<br><br>Findings indicate prevention programs with DS as a component can reduce suicide related events. Some interventions likely not generalizable to every day practice. |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| Mojtabai (2010). Does depression screening have an effect on the diagnosis and treatment of mood disorders in | Practice Variation Framework | Observational study / quantitative<br><br>**Purpose:** examine effects of DS on dx and | n=73,712<br>F>M<br>RS collected from NAMCS<br><br>**IC:** Non - psychiatric visits | IV-DS<br>DV1- mood disorder dx<br>DV2- tx with antidepressant | NR | Stata 11<br><br>Wald tests, Rho co-efficients, Probit analyses, adjusted *F* tests | DS occurred in 1.8% of sample<br><br>**DV1:** positive association between DS and | **Level IV**<br><br>**Strengths:** Large sample size, detailed explanation of methods, |

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| general medical settings? An instrumental variable analysis of the NAMCS.<br><br>Funding/Bias/Conflicts: none identified<br><br>USA | | tx decisions in patients with MDD in usual practice | from 2005-2007 | | | 95% CI | dx (B=0.690, *SE*=0.087, p< 0.001)<br>Probability of Dx in screened 0.039 vs 0.007 in non-screened<br><br>**DV2:**<br>positive association between DS and tx (B=0.545, *SE*=0.274, p= < 0.001)<br>Probability of tx 0.139 in screened vs 0.052 in non-screened | description of conceptual framework<br><br>**Weaknesses:**<br><br>NAMCS data-unable to independently verify dx, screening instruments not identified<br><br>**Conclusion:**<br><br>DS helps identify MDD and increases probability of tx |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| O'Conner et al. (2016). Screening for depression in adults: An | Population Health framework | SR / quantitative<br><br>**Purpose:**<br>Systematically review and | N=71<br>n=3,814<br>F>M<br><br>**IC:** | IV1- DS<br>IV2- feedback<br>IV3- tx interventions | PHQ-9; HAM-D; Geriatric Depression Scale; Beck Depression Inventory; CES-d | Stata 13.1<br><br>DerSimonian and Laird pooled estimate; | **DV1 / DV2:**<br>DS programs increased remission or tx response 20%- | **Level I**<br><br>**Strengths:**<br><br>Sound methods, |

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| updated systematic evidence review for the USPSTF.<br><br>Funding: AHRQ<br><br>Bias/conflicts: none identified<br><br>USA | | update benefits and harms of DS in adults to aid the USPSTF in updating its recommendation<br><br>**Methods:** Searched 4 databases from 2009-2015; websites of government agencies, professional organizations for grey literature; reviewed journal tables of contents | Studies targeting DS; Brief standardized instrument designed to identify persons with depression; PC settings; RCTs, CCTs; SR<br><br>**EC:** Comparative effectiveness studies; study populations with pre-existing depression; intervention is second line tx; studies with f/u period < 6 weeks | DV1- depression remission<br>DV2-symptom reduction<br>DV3- health outcomes<br><br>Health outcomes: improved outcomes defined as decreased symptoms; decreased suicide deaths, attempts or ideation; improved functioning; improved quality of life; improved health status | Tested for use in older adults:<br><br>PHQ-9: sensitivity 88%, specificity 80%<br>GDS: sensitivity 75%, specificity 70%, CES-d: sensitivity 83%, specificity 78%, BDI: sensitivity 88%, specificity 81.7%<br><br>Unknown if tested in older adults:<br><br>HAM-D | Egger's test; contingency tables; Knapp Hartung modification; Forest plots | 80%<br><br>7/9 studies showed improvement in symptoms or remission but only 2 significant: RR 1.19 (95% CI, 1.06-1.34) RR 1.71 (95% CI, 1.13-2.57) NS studies range from RR 1.13 (95% CI, 0.46-2.79) to RR1.79 (955 CI, 0.94-3.41) | large number of studies, thorough explanation of methods, PC setting, adequate f/u time among studies<br><br>**Weaknesses:**<br><br>Many studies underpowered to detect even large differences in treatment effect, significant heterogeneity among study interventions prevents meta-analysis, greater number of females<br><br>**Conclusion:**<br><br>DS programs are effective in improving symptoms and remission when |

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| | | | | | | | | identified MDD leads to tx |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| O'Conner et al. (2009). Screening for depression in adult patients in primary care settings: A systematic review.<br><br>Funding: AHRQ<br>Bias/conflicts: none identified<br><br>USA | Population Health Framework | SR / quantitative<br><br>**Purpose:**<br>SR for USPSTF about benefits and harms of adult DS in PC<br><br>**Methods:**<br>Searched 5 databases from 1998-2007 | N=33<br>n=12,432<br><br>**IC:**<br>Study focus on DS; outcomes identified; SR; RCT; large cohort studies with minimum 1000 participants; PC setting<br><br>**EC:**<br>Inpatient setting; intervention not appropriate for PC; focus on children; non-English language; | IV1-DS<br>IV2- DS with feedback and/or support interventions<br>IV3-tx interventions<br>DV1-depressive symptoms & remission<br>DV2-health status/outcome<br>DV3-depression dx<br><br>Definitions:<br>Health status/outcomes defined as improvement in | PHQ-9, HAM-D; CES-d<br><br>Tested for use in older adults:<br><br>PHQ-9: sensitivity 88%, specificity 80%, CES-d: sensitivity 83%, specificity 78%<br><br>Unknown if tested in older adults:<br><br>HAM-D | SAS 8.2<br><br>Poisson distribution; qualitative synthesis<br><br>95% CI | **DV1:**<br><br>IV1- 1 study on effects of DS on MDD symptoms: remission achieved in 48% screened vs 27% of non-screened ($p < 0.05$).<br><br>IV2-<br>5/7 studies show significant improvement in symptoms and remission ($p< 0.05$);<br>2/7 show NS improvement in | **Level I**<br><br>**Strengths:**<br>Large number of studies, examined tx in older adults; PC setting<br><br>**Weaknesses:**<br>Heterogeneity among studies prevents meta-analysis, mixed quality of studies<br><br>**Conclusion:**<br>Findings indicate screening programs are beneficial when |

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| | | | outcomes not disclosed; f/u period < 6 weeks | comorbid illness, reduction in physical symptoms, reduction in SI<br><br>Suicidal behaviors: acts or attempts to self-harm | | | symptoms or remission<br><br>**DV2:**<br><br>IV3- suicidal behaviors reduced in older adults with tx, OR 0.06 (95% CI, 0.01-0.58); SI reduced in older adult OR 0.39 (95% CI, 0.18-0.78) | DS leads to Dx and tx; tx reduces SI in older adults |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| Oyama (2016) Long-term effects of a screening intervention for depression on suicide rates among Japanese community-dwelling older | Inferred-Population Prevention framework | CCS / quantitative<br><br>**Purpose:** Evaluate long-term impact of routine depression screening on | n= 4,918<br>F>M<br>Age ≥ 65<br><br>Geographic cohort sampling<br><br>**Setting:** Community | IV1- DS<br>IV2- DS & education<br>IV3- usual care<br><br>DV1-suicide rate<br><br>Definitions: | SRDS; GDS; CIDI<br><br>Validated in older adults:<br><br>Zung: sensitivity 58%-76%, specificity 82%- | SPSS<br><br>Mixed-effects binomial regression models; repeated-measures linear models; IRR | 48% decrease in suicide rate in IG vs no change in CG<br><br>IRR in IG 0.52 (95% CI, 0.33-0.83, *p*=0.008) | **Level III**<br><br>**Strengths:** Large sample size, long f/u period<br><br>**Weaknesses:** Japanese study- |

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| adults<br><br>Bias/Conflicts: none identified<br><br>Funding: Japan Ministry of Health<br><br>Japan | | suicide rates in older adults | setting in Japan | Usual care: usual periodic health check-ups for general population | 86%<br>GDS: sensitivity 75%, specificity 70%<br><br>Unknown if validated in older adults:<br>CIDI | | IRR in CG 0.93 (95% CI, 0.69-1.26)<br><br>Ratio of IRR between CG and IG 1.83 (95% CI, 1.08-3.09, *p*= 0.026) | may reflect cultural factors not present in U.S.<br><br>**Conclusion:** DS programs can reduce SI and suicide rate |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/ Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |
| Pfoh et al. (2015). Conformance to depression process measures of medicare part b beneficiaries in primary care settings.<br><br>Funding: AHRQ<br><br>Bias/ Conflicts: none identified | Inferred- Quality Performance Framework | Cross-sectional study using EHR data / quantitative<br><br>**Purpose:** evaluate conformance to DS, management, and outcome quality indicators and identify characteristics associated with conformance | N= 34 clinics<br>n= 5000<br>F>M<br><br>Quota RS: half had annual well visit and half routine visit<br><br>**IC:** selected through RS<br><br>**EC:**<br>DS within 4 | IV1- annual well visit<br>IV2- routine visit<br>DV-DS<br>DV2- reassessment within 3 months after new dx of MDD<br>DV3- depression response (> 50% reduction in symptoms measured by | PHQ-9<br><br>Tested in older adults: sensitivity 88%, specificity 80% | Stata 12<br><br>Descriptive analyses; Multivariate logistic regression | DS rate 17%<br><br>Odds of DS for general visit: AOR 1.16 (95% CI, 0.86-1.55)<br>Odds of DS for well visit: AOR 0.41 (95% CI, 0.30-0.56)<br>Odds of depression response: AOR 3.93 (95% CI, | **Level IV**<br><br>**Strengths:**<br><br>Large sample size, clear findings, PC setting, no bias noted<br><br>**Weaknesses:**<br><br>Lower level evidence, |

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| USA | | to these measures. | months; depression remission within 1 year | PHQ-9)<br>DV4- remission within 12 months (PHQ-9 score < 5) | | | 1.46-10.57, $p <$ 0.05)<br><br>Odds of reassessment within 3 months: 0.71 (95% CI, 0.17-3.02) | retrospective data, use of EHR records, no identification of factors that contribute to increased odds of response<br><br>**Conclusion:**<br><br>Findings indicate rate of DS is low. Does show that people in study with DS had greater odds of response. |
| Citation | Theory/ Conceptual Framework | Design/ Method | Sample/ Setting | Major Variables & Definitions | Measurement/Instrumentation | Data Analysis (stats used) | Findings/ Results | Level/Quality of Evidence; Decision for practice/ application to practice |

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| Pignone et al. (2002) Screening for depression: Systematic evidence review.<br><br>Funding: AHRQ<br><br>Bias/Conflicts: none identified<br><br>USA | Population Health Framework | SR / quantitative<br><br>**Purpose:** Examine effectiveness of DS in PC settings<br><br>**Methods:** Searched 2 databases from 1966-1999; Reviewed bibliographies | N= 70<br>n= 15,263<br>F>M<br><br>**IC:** English language; RCT; SR/MA; PC setting; original research<br><br>**EC:** Non-PC setting; focus on children; non-English; no original data | IV1-DS<br>IV2-DS with feedback<br><br>DV1-dx<br>DV2-tx<br>DV3-outcomes<br><br>Outcome defined as decreased MDD symptoms, improved quality of life, and reduction in morbidity/mortality | HAM-d; BDI<br><br>BDI tested in older adults: sensitivity 88%, specificity 81.7%<br><br>Unknown if HAM-d tested in older adults | Stata 6.0<br><br>DerSimonian and Laird random-effects model | Risk of persistent MDD after DS: RR 0.87 (95% CI, 0.79-0.95), RRR 13%; ARR 9%; NNT achieve remission at 6 months= 11<br><br>**DV1:** 4/12 studies showed significant increase in dx ($p < 0.05$) in IG with DS vs CG with no DS; 2/12 studies NS ($p > 0.05$); 6/12 studies did not report significance data; Rate of dx from DS increased 10%-47.5%<br><br>**DV2:** 4/10 studies had higher rates of tx in IG vs CG ($p < 0.05$); | **Level I**<br><br>**Strengths:** Large number of studies, SR, clear methodology, clearly stated research questions, detailed explanation of included studies strengths/ weaknesses<br><br>**Weaknesses:** Level of significance NR in some studies. Heterogeneity of studies prevented meta-analysis, some studies had missing data<br><br>**Conclusion:** Findings support DS in PC. DS increases incidence of dx and tx. |

Key: **AHRQ-** Agency for Healthcare Research and Quality; **AOR-** adjusted odds ratio; **ARR-** absolute risk reduction; **BDI-** Beck Depression Inventory; **CG-** Control Group; **CI-** confidence interval; **CIDI-** Composite International Diagnosis Interview **DS-** depression screening; **DV**-dependent variable; **dx-** diagnosis; **EC-** exclusion criteria; **EHR-** electronic health record; **f/u-** follow-up; **GDS-** Geriatric Depression Scale; **HAM-d-** Hamilton Depression Scale; **IC-** inclusion criteria; **IV**- independent variable; **IG-** intervention group; **IRR-** incident rate ratio; **MA-** meta-analysis; **MDD**- major depressive disorder; **MH-** mental health; **MMSE-** mini mental status exam; **N**-number of studies; **n**- number of participants; **NAMCS-** National Ambulatory Medical Care Survey; **NNT-** number needed to treat; **OR-** odds ratio; **PC-** primary care; **PHQ-9-** Patient Health Questionnaire-9; **PCP**-primary care provider; **RI-** relative incidence; **RS-** random sampling; **RR-** relative risk; **RRR-** relative risk reduction; **SR-**systematic review; **tx-** treatment; **SRDS-** Zung Self-Rated Depression Scale; **USPSTF-** U.S. Preventive Services Task Force

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| | | | | | | | 3/10 had higher tx in IG vs CG but NS;<br>2/10 had higher tx rates in IG but significance NR;<br>1/10 studies had higher tx rates in CG than IG<br><br>**DV3:**<br>In 5/9 studies significant improvement in outcomes ($p < 0.05$);<br>In 1/9 studies improvement NS;<br>In 3/9 studies, outcomes improved but significance NR | |

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