Implementation of a Suicidal Ideation Treatment Algorithm in a Military Medicine Primary Care Clinic

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Mianna Gale is a full-time student at Arizona State University.

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Abstract

Primary care providers (PCPs) are frequently the first line of treatment for suicidal ideation (SI) patients. Many PCPs report low self-efficacy in treating suicidal patients, leading to inappropriate treatment plans or avoidance of discussing SI. This quality improvement project based on the Uncertainty Reduction theory aimed to evaluate PCP's perceptions of an SI treatment algorithm and its impact on self-efficacy. Secondary aims included assessing PCP's confidence in treating suicidal patients and current treatment practices. A pre- then post-intervention survey design was utilized. All PCPs treating patients in a military medicine clinic were invited to participate in the project. Participants were sent a recruitment email containing the suicidal ideation treatment algorithm and a link to a survey developed with Qualtrics software. Participants were asked to review the SI algorithm, answer the baseline survey questions, and complete a second eight-week survey. For human subjects' protection, the survey responses were anonymous. Demographic data collected included years of clinical experience and licensure type. The data were evaluated with Intellectus software. Due to limited participation, N=4, there was insufficient data to determine the significance of implementing the SI algorithm in a primary care clinic. Central tendencies showed that most providers (n=3, 75.00%) felt less than confident treating suicidal patients. Half of the providers asked non-mental health patients about suicide less than 40% of the time (n=2, 50.00%). The data suggest that PCPs feel uncomfortable treating suicidal patients and may benefit from additional resources and training in this area.

Keywords: primary care, suicidal ideation treatment algorithm, provider self-confidence

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Suicide rates nationally and within the military continue to increase every year despite multiple local, state, and national initiatives to raise suicide awareness and prevention over the last several decades. The lack of impact from these initiatives may be related to a lack of provider confidence in treating this patient population and the continued stigma associated with suicide and suicidal ideations (SI) in the general public and within the healthcare community.

Background and Significance

There is a significant under-reporting of SI in patients seen by a primary care provider (PCP). In a group of people who completed suicide, half were seen within a month, and almost 80% were seen within a year of their deaths by a PCP (Ahmedani et al., 2014; Hauge et al., 2018; Rodi et al., 2009). Two-thirds of patients screened for SI before their deaths denied having them, and half of those patients were dead within two days of being screened (Berman, 2017). These reports indicate a substantial number of patients who could have received lifesaving intervention at a primary care office before their deaths.

PCPs frequently report low self-efficacy when treating suicidal patients, likely leading to less effective suicidal ideation assessment. Most providers indicate they feel confident in diagnosing depression, but when asked about suicidal patients, 60% of providers report feeling uncomfortable with managing their care (Michail et al., 2017). Due to this uncertainty, physicians report they only ask patients about SI approximately 37% of the time. This percentage remains the same even when the provider perceives the patient is depressed (Hooper et al., 2012). These statistics are especially concerning given the fact that suicidal patients are significantly more likely to be seen by a PCP than specialty care (John et al., 2020; Schaffer et

al., 2016). This lack of self-efficacy is likely related to the stigma associated with SI patients and the ambiguity of SI, considering that the severity of suicidality is entirely based on subjective information disclosed by the patient. Providers fear financial liability, personal guilt, and are at an increased risk of experiencing burnout following a patient's suicide (Oravecz & Moore, 2006; Schmitz et al., 2012).

Purpose and Rationale

Suicide is preventable, and appropriate risk assessments and interventions save lives (Hogan & Grumet, 2016). The actions that occur following a patient's self-report of SI impact their potential outcomes and the likelihood of reporting suicidal thoughts in the future. An underreaction on the provider's part can lead to a suicide attempt. In contrast, an overreaction can lead to increased depression, isolation, hopelessness, stigmatization, financial strain, and a decreased likelihood of patient disclosure in the future. Patients have reported they frequently do not disclose thoughts of suicide because of fears of overreaction on the provider's part (Richards et al., 2019).

The level of importance for developing an appropriate treatment plan, the high number of patients that completed suicide despite being seen by a PCP shortly before their deaths, and the reported general lack of confidence among PCPs in treating SI indicate a treatment gap that needs to be addressed. The purpose of this project was to evaluate PCP's perceptions of a SI treatment algorithm and its impact on self-efficacy. The secondary aim was to assess PCP's current confidence in treating SI and current treatment practices.

Epidemiological Data

Suicide is devastating for the friends and family of the deceased and has a significant impact on society as a whole. In the United States (US), suicide is the 10th leading cause of

death in all age groups, the second leading cause of death in adolescents and young adults, and the fourth leading cause of death in middle-aged adults (Curtin, 2020; Hedegaard et al., 2021). The total societal monetary cost of suicide in medical expenses, lost productivity, and resource utilization for combined suicide attempts and completions in 2013 was 93.5 billion dollars (Center for Disease Control and Prevention [CDC], 2017).

In 2019 there were 1.4 million suicide attempts and over 47,000 completed suicides throughout the US (American Foundation for Suicide Prevention [AFSP], 2021). That same year almost 5% of adults and 19% of high school-aged adolescents reported serious thoughts about committing suicide (America's Health Rankings, 2021; National Institute of Mental Health [NIMH], 2021). The global pandemic has increased suicide rates, indicating urgency in addressing this issue. Post-COVID ER visits in the young adult population, ages 12-25, have increased by 30-50% (Center for Disease Control and Prevention [CDC], 2021). The rate of active-duty military member suicides increased by 25% in 2020 compared to the previous year (Losey, 2021).

Internal Evidence

The project site is a military primary care clinic in the southwest United States that treats active-duty military personnel, military retirees, and their families. The age range of patients is birth to death. Approximately 90,000 primary care visits occur in the clinic every year (Luke Air Force Base, n.d.). Routine Patient Health Questionaire-9 and Generalized Anxiety Disorder-7 screenings are performed on all patients being seen in the 56th Medical Group. There is no specific treatment tool in place that guides the care of patients after they have reported SI. The clinic's internal evidence indicates a general lack of confidence in treating SI and a lack of available resources to help guide treatment. Providers within the clinic report that when a patient

discloses thoughts of suicide, they are unsure of the next appropriate steps. They also have difficulty differentiating between appropriate patients to continue in the clinic and those that require a higher level of care (H. Toberman, personal communication, February 23, 2021).

The United States Air Force (USAF) has maintained a strong focus on suicide prevention since implementing the Suicide Prevention Initiative in the 1990s. This initiative includes 11 components that focus on prevention, intervention, and post-suicide response (The United States Air Force, 2019). The main focus of this initiative is to influence culture throughout the USAF by providing education and guidance to Unit Commanders, leadership, individual Airmen, and military families. The initiative effectively decreased suicide rates by approximately 30% within the first few years of implementation (Hogan & Grumet, 2016). However, this initiative focuses on influencing USAF culture as a whole and does not provide guidance for the medical treatment of SI patients.

PICOT Question

Researching this treatment gap led to the PICO question, [P] in primary care providers in a military medicine clinic [I] how does having a suicidal ideation treatment algorithm [C] compared to not having a treatment algorithm [O] affect the provider's level of treatment confidence?

Evidence Synthesis

Search Strategy and Literature Review

A thorough review of the evidence was conducted to evaluate this PICO question. This review included four databases: PsychInfo, PubMed, Academic Search Premier, and the Cochrane library. PsychInfo was incorporated due to the intervention's mental health aspect, and the Cochrane Library was chosen to encompass relevant grey literature. PubMed and Academic

Search Premier offered a broad range of available literature. The initial search incorporated key terms for all of the components in the PICO question, including relevant synonyms: primary care providers, primary healthcare, suicidal ideation treatment algorithm, provider confidence, and self-efficacy. However, using these specific terms resulted in eight articles among all four databases.

As a result, the search was widened to include all treatment algorithms utilized in primary care by removing the words suicidal ideation from the key terms. Additional MeSH terms were also added to capture more material resulting in a search with the following key terms: primary care, primary health care, general practice, algorithm, treatment algorithm, intervention guideline, treatment protocol, provider confidence, self-efficacy, attitude, and perception. These terms resulted in a much higher yield; 42,630 results from PsychInfo, 431 results from PubMed, 526 results from Academic Search Premier, and 61 from the Cochrane library. A considerable proportion of the articles were irrelevant to the PICO question due to the common use of the word algorithm in explaining methods for statistical data collection. Therefore, the search was narrowed by incorporating the keyword implementation and only included articles with publication dates from 2001 until the present to elicit a more relevant yield and narrowed. With this strategy, the final results included one from PsychInfo, 60 results from PubMed, 138 results from Academic Search Premier, and 19 results from the Cochrane library. These results were evaluated by reading the title and abstract of each article to determine relevance to the project. This process resulted in a final yield of 22 relevant articles.

The quality of studies available to evaluate provider perceptions and confidence were low-level evidence. Therefore patient outcomes were also included in the evaluation to determine how algorithms affected provider efficiency as evidenced by improved patient

outcomes. Due to the varying levels of evidence associated with the different outcomes, several articles that evaluated physiologic medical problems were chosen, in addition to those that evaluated subjective data. The physiologic medical data generally provides a higher level of evidence. However, mental health complaints have subjective data. This combination was determined to be the most robust means of evaluating the effectiveness of the intervention type.

Inclusion criteria for the relevant articles included a primary care setting, the use of a treatment algorithm or equivocal brief intervention tool, and post-intervention provider perceptions or patient outcomes. Articles were excluded if the results from the intervention were related to a multi-faceted program in general and did not provide specific information regarding the treatment algorithm portion of the intervention. After determining inclusion, each of the 22 relevant articles was evaluated with a rapid critical appraisal checklist to select the ten most relevant studies. The final studies included four randomized control trials, two non-randomized controlled trials, and four cohort studies (See Appendix A).

Foundation of Research and Evidence

All studies showed an improvement in measured outcomes. Studies showed homogeneity in the consistency of the primary care clinic setting and heterogeneity in the age range and symptom type. Studies included pediatric patients, adult patients, and geriatric patients. Studies were also conducted in multiple countries and several different socioeconomic settings (See Appendix A). Four studies evaluated subjective symptoms, and the remainder assessed physiologic medical conditions. A medication guide was included in four studies, along with the algorithmic tool. The use of multiple interventions limits the ability to determine if the algorithmic tool alone would have led to the same outcome improvements. The majority of the

studies were quality improvement projects. Most of the data were interviews, surveys, or chart reviews. Changes in screening scores were utilized in two studies (See Appendix B).

The combination of study types and evaluation of multiple outcomes gave strength to the evidence by determining that the implementation of algorithmic tools improves care in a broad population range, a variety of settings, and in multiple disease processes. Algorithmic tools improved patient outcomes and provider knowledge and confidence in treating patients appropriately.

Influence on Project

Algorithms are commonly used in primary care to guide treatment. The review of evidence revealed that research specifically focused on using SI treatment algorithms in the primary care setting is limited. However, the evidence supports the use of general patient treatment algorithms in primary care based on the results indicating they effectively improve patient outcomes, provider knowledge, and provider confidence. Implementing concise and efficient treatment algorithms improves care outcomes (Haran et al., 2020). Additionally, the American Family Physicians website (2021) supports the use of treatment algorithms by providing links to hundreds of algorithms that can assist in treating a plethora of care items, including medication management, disease management, and risk assessments for mental illnesses. Despite the lack of research specific to primary care patients with suicidal ideations, all of the evidence indicated that incorporating a suicidal ideation treatment algorithm in the primary care settings may impact provider confidence and patient outcomes. Therefore a treatment algorithm was an appropriate intervention to utilize for this project.

Theoretical Framework

The goal of providing practitioners with a treatment algorithm was to increase self-efficacy by reducing uncertainty. The Uncertainty Reduction Theory (URT) was used as the theoretical framework to guide this project (See Appendix C). According to the URT by Mark Redmond (2015), people attempt to reduce uncertainty in interpersonal relationships by increasing the amount of information they have to predict how an interaction will unfold. This concept applies to the provider and patient relationship because providers are more comfortable treating patients when they feel they have enough information or knowledge about the patient's complaint to confidently predict how the patient interaction will progress and what treatment outcomes will be. The project aimed to reduce providers' uncertainty by giving them a treatment algorithm that provided step-by-step instructions for developing an appropriate treatment plan for suicidal patients. Ideally, this reduction in provider uncertainty will lead to more competent assessments and appropriate care for patients in the future.

Implementation Framework

The implementation framework for this project was a quality improvement project. Quality improvement projects aim to adapt current processes or implement new processes within a specific site to improve patient outcomes (Conner, 2014). The quality improvement model utilized was the Find, Organize, Clarify, Understand, Select, Plan, Do, Study, Act (FOCUS-PDSA) model (See Appendix D). This model is an expansion of the commonly utilized PDSA model. It was appropriate for this project because it provided steps for project development and implementation (American College of Cardiology [ACC], 2013). The PDSA model evaluates the impact of small changes on patient outcomes and is appropriate for implementation in a small setting such as a single clinic (Institute for Healthcare Improvement [IHI], n.d.). Incorporating

the additional FOCUS framework provided a step-by-step guide for developing the intervention before implementation (Taylor et al., 2013).

Methods

Ethical Consideration and Human Subject Protection

There were no significant ethical concerns for this project. No identifying information was collected to protect participants from a loss of anonymity, and there was no follow-up with individual participants. The initial and follow-up surveys were not linked to each other. Additionally, no sensitive information was collected from participants. Therefore, if anonymity is lost, there will likely be no significant consequences for individual participants.

The Arizona State University IRB approved this project's social behavioral protocol application with an expedited review. There is no IRB at the site organization. Therefore, no additional approvals were required.

Population and Setting

Participants in the project were physicians, family nurse practitioners, and physician's assistants working in a military medicine primary care facility in the Southwestern US. The clinic treats active-duty military personnel, military retirees, and their families. The age range of patients is birth to death. The participants were active-duty military members and Department of Defense contract employees. Inclusion criteria included actively working in direct patient care within the clinic. Any providers either out of the clinic for a prolonged period due to deployments or medical leave or not currently practicing in direct patient care were excluded. All providers that met the criteria for inclusion were recruited by email.

Project Description and Timeline

The suicidal ideation treatment algorithm from the VA/DoD Clinical Practice Guideline for the Assessment and Management of Patients at Risk for Suicide was used as the intervention for this project (The Department of Veteran Affairs [VA] & The Department of Defense [DoD], 2019). The guideline was created by an evidence-based project workgroup composed of medical specialists in a joint effort between the Department of Veteran Affairs and the Department of Defense (The Department of Veteran Affairs [VA] & The Department of Defense [DoD], 2013). The guideline was initially released in 2013, and an updated version was released in 2019. The original guideline was over 100 pages, and the revised version is 32 pages. The length of these documents makes it impractical for use as a brief intervention tool which is likely why it is not utilized routinely, even within the military community, despite being full of useful information and readily available on the Department of Defense website. Therefore, only a pdf copy of the treatment algorithm, located on pages 8-14 of the revised document, was utilized as the intervention for this project (See Appendix E).

Recruitment and implementation for the project were conducted via email. In August 2022, an email was sent to potential participants. The email contained a description of the project, a request for participation, a link to the initial survey, and instructions to review the attached algorithm before answering the survey questions. The intervention was included as a pdf attachment to the email. An email was sent eight weeks later to complete the second survey.

Instrumentation, Data Collection, and Data Analysis

Surveys created with Qualtrics software for this project were utilized for data collection. The initial survey contained questions about providers' treatment confidence before and after reviewing the algorithm, current practices related to discussing suicide with patients, and participants' perceptions of the algorithm. The second survey would have evaluated change over

time with questions about treatment confidence and if the participants have utilized the algorithm for patient care since they received it eight weeks ago. Demographic data included gender, type of licensure, and years of clinical experience. Ordinal data from the Likert scale survey questions and demographic data were extracted from the surveys and evaluated with Intellectus Statistics. Descriptive statistical analysis was performed on the data, including central tendencies and frequencies. There was no funding for the project, and no compensation was provided to participants.

Results

The study participants (N=4) included two nurse practitioners, one physician, and one physician assistant. Half of the participants had more than ten years of experience, and all participants were employed in primary care.

Outcomes

The primary outcome of this project was to evaluate PCP's perceptions of the SI treatment algorithm and its impact on self-efficacy. To assess the primary outcome, the participants were asked to rank the algorithm's applicability for use in the primary care setting on a scale of one-not applicable to five-standard of care. The majority of participants reported this tool was applicable for use in primary care with an average of 4.67 (SD = 0.58, SEM = 0.33, Min = 4.00, Max = 5.00). The participants were also asked the likelihood that they would use this tool in their practice in the future on a scale of one-will not use to five-definitely will use. The majority of participants reported they were likely to use the algorithm with an average of 4.00 (SD = 1.00, SEM = 0.58, Min = 3.00, Max = 5.00).

A comparison was going to be made between the initial and eight-week follow-up data to assess the impact on self-efficacy. However, only one provider completed the follow-up survey,

and therefore there was not enough data available to compare groups. In the initial survey, participants were asked to compare their confidence in treating patients before viewing the algorithm compared to after viewing the algorithm. Prior to viewing the algorithm all of the participants reported they were at least confident asking patients about SI (n=4, 100%) with an average of 3.50 (SD = 1.00, SEM = 0.50, Min = 3.00, Max = 5.00). After viewing the algorithm the majority of participants were very confident (n=2, 66%) and one participant reported being somewhat confident confident (n=1, 33%) with an average of 3.33 (SD = 1.15, SEM = 0.67, Min = 2.00, Max = 4.00).

The secondary aim was to evaluate PCP's current confidence in treating SI patients and current treatment practices. The majority of participants reported they were less than confident treating suicidal patients with an average of 2.25 (SD = 1.26, SEM = 0.63, Min = 1.00, Max = 4.00). When asked about current treatment practices, participants reported that they always ask mental health patients about SI with an average of 5.00 (SD = 0.00, SEM = 0.00, Min = 5.00, Max = 5.00). However, half of the participants ask non-mental health patients about SI rarely or less (n=2, 50%) with an average of 3.00 (SD = 1.83, SEM = 0.91, Min = 1.00, Max = 5.00).

Project Impact

There was insufficient data to determine whether the algorithm would impact the provider's long-term self-efficacy. Participants reported they would use this tool in their practice in the future, indicating that they are looking for additional resources to guide the care of SI patients, and the use of these resources may improve self-efficacy. This project can be sustained by embedding the SI treatment algorithm into the electronic health record used in all military medicine clinics in all of the military branches. Embedding the algorithm would allow it to be accessed freely by all providers.

This process change would influence many stakeholders within the organization. Organizational leadership is responsible for organization-wide operations, including creating, disseminating, and implementing policies and procedures, including those that dictate patient care. For this process change to become utilized throughout the military, organizational leadership would need to rewrite the current policies to include the use of the algorithm in routine patient care. Another key stakeholder is the leadership team within each specific Medical Group. The group leadership team is responsible for the health and safety of the personnel and patients within the Medical Group. The primary care providers are stakeholders and are directly responsible for patient care, including the appropriate assessment, treatment, and long-term follow-up for each patient. Patients are also stakeholders because they are the recipients of service. Patients are directly affected by changes in care and providers' level of self-efficacy and competence in providing them with care. The medical group leadership, primary care providers, and patients will all be directly affected by the influence of the implementation of the algorithm.

Discussion

Providers in the clinic had a positive response to the intervention. They indicated they would use this algorithm in their practice moving forward, and they felt it applied to the primary care setting. Providers reporting low confidence in treating SI patients was in line with previous studies (Michail et al., 2017). Interestingly, one provider reported feeling less confident after viewing the algorithm than before viewing it. This may have been an error in placing the pre-question response in the post-question answer. It also could have been due to the provider realizing after viewing the algorithm that they did not know as much about the SI assessment process as they previously believed they did.

The results of current patient care practices were mixed compared to other studies. Participants reported that they do not routinely ask non-mental health patients about SI, which is in line with previous studies (Graham et al., 2011). However, participants reported that they always ask mental health patients about SI. In previous studies, even mental health patients were only asked about SI less than 40% of the time (Hooper et al., 2012). This difference may be due to specialized training provided in this specific clinic or how the question was worded.

Limitations and Barriers

The small number of participants and the lack of long-term follow-up data were significant limitations to this study. Several barriers were encountered during this project. The COVID-19 pandemic limited the ability to provide in-person learning or direction at the clinic site. Conducting the project exclusively online via email led to some confusion in completing the survey. One participant did not review the algorithm before completing the initial survey. The online-only format also likely decreased the number of participants for the study. The other significant barrier was a last-minute deployment during the project. The deployment took most participants out of the clinic before the second survey was sent. Therefore those participants were unavailable to complete the follow-up survey.

Conclusion

Disseminating information to providers regarding the need to improve practice is not challenging. The difficulty lies in initiating a behavior change that will lead to treatment improvements. Given the high number of patients seen by a PCP before their deaths by suicide, improving training and resources in this population can profoundly impact SI patients. It may potentially be the key to reducing suicide rates in the future. Although the impact of implementing the VA/DOD suicidal ideation treatment algorithm could not be adequately

assessed due to the limited data collected, the consensus amongst providers was that the treatment algorithm was applicable in the primary care setting. Therefore the recommendation is to make this resource available to all PCPs working in military medicine clinics throughout the various branches of the armed forces. Further research should include large-scale longitudinal studies that can assess the impact on provider self-efficacy and patient outcomes after the VA/DOD suicidal ideation treatment algorithm has been implemented in military medicine primary care clinics.

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Appendix A

Table 1

Quantitative Evaluation Table

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
Citation Alexopoulos, G. S., et al. (2009) **Country** United States **Funding** Grant support Cephalon & Forest; Pharmaceutical company. **Bias** Pharmaceutical associations for multiple authors.	Treatment algorithm based on the Agency for Health Care Policy and Research Practice Guidelines.	**Design** Randomized control trial. **Purpose** Evaluate the impact of a care management intervention on suicidal ideation and depression in older adults.	**N=** 599 **Demographics** Age 60+ PCP patients with major depression. Female= 72% Minority= 32% Majority single, lived alone **Setting** 20 PCP offices; urban, suburban & rural. Pairs of socioeconomically equivocal offices were formed & then control offices were randomly assigned for each pair **Exclusion** Age <60 **Attrition** At 24 months 43% of intervention and 37% of control failed to complete assessment	**IV1** PROSPECT program **DV1** Reported SI **DV2** Course of depression (Severity, Treatment response, Remission) **Definition** Treatment= decreased HDRS score ≥50% Remission- HDRS <7	Structured interview HDRS MMSE SSI	Omnibus statistics test, SAS PROC MIXED, NLMIXED, & GLIMMIX	**Reported SI:** treatment group > than control 4 month: 12.8% vs 3.0% P=0.02 24 month: 18.3% vs 8.3% P=0.12 **Severity**: Greater in baseline scores intervention group. **Response**: Higher response intervention group. $x^2(5)=17.3$ P<0.004 **Remission:** Overall increased in treatment group only until 8 months. Then equal for both groups. Major depression remission rates were higher in treatment group at 24 months.	**Level of Evidence-** 2 RCT **Strengths** Long study time. **Weakness** Only evaluated older adults. Decreases generalizability for use in all age groups. Blinding was not possible due to the lack of ancillary staff and algorithm use in the control group. **Feasibility** The increased cost associated with incorporating care managers may reduce feasibility of implementation. Not generalizable. QI project specific for site where it was implemented.

Key: DV-dependent variable; EBP-Evidence Based Practice IV-independent variable; HDRS-Hamilton Depression Rating Scale; MMSE-Mini Mental State Examination N- number of studies; n-number of participants; NA-Not applicable PCP-primary care providers; QI-Quality Improvement SI- suicidal ideation; SSI-Scale for Suicidal Ideation; vs-versus;

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
Citation Amin, R., & Thomas, M. (2020) **Country** United States **Funding** Not reported **Bias** Military setting. Author worked in clinic of study.	QI project. Curriculum based on Plan, Do, Study, Act framework.	**Design** One group pretest and posttest intervention survey. 6 month follow up survey. **Purpose** Evaluate PCP attitudes, knowledge, and skill in treating mental health patients after intervention.	**N= 35** **Demographics** Primary Care Physicians-4 Physician assistants- 31 Mean years in practice 3.63 **Setting** Military PCP **Exclusion** NA **Attrition** Immediate-0% 6-month -30 %	**IV1-** Depression and anxiety management training and decisional tool. **DV1-** Provider confidence & perceived knowledge **DV2** Psychotropic prescribing practices	Likert scale survey.	Performed on IBM SPSS; Independent T-test, Paired T-test, Cohen d.	**Post-intervention** **DV1:** Confidence $t(35)= -3.509$, $P < 0.001$, $d = 1.06$ Perceived knowledge: $t(37) = -3.554$, $P < 0.001$, $d = 1.08$. **Follow up:** **DV2:** Intervention led to practice change- $t(9)=-2.714$, $P < 0.02$, $d = 0.58$. **DV1**: Subjective reports decision tool very helpful.	**Level of Evidence** 4 Cohort study **Strengths** Follow up survey provides data regarding long term improvements. Appropriate statistical analysis performed. **Weakness** Study only conducted in one clinic. Low level of evidence. Low follow up response rate. **Feasibility** Not generalizable. QI project specific for site where it was implemented.
Citation Aminsharifi, A., et al. (2018) **Country** United States **Funding** Duke Cancer Institute federal grant **Bias** None	QI project. Evidence based treatment algorithm developed.	**Design** One group posttest survey & chart review **Purpose** Assess practice changes and provider attitudes after algorithm implementation.	**N**=106 **Demographics** PCP **Setting** All primary care offices within a large healthcare organization. Patient chart review Men Age-40-74 **Exclusion** NA **Attrition** NA	**IV1-** Prostate cancer screening algorithm **DV1** Reported provider confidence **DV2** Number of prostate screenings	Likert scale survey Chart review	Raw data reported	**DV1:** 79% of PCP reported feeling very confident in screening patients. **DV2:** Prostate screening rates increased by 9%	**Level of Evidence** 4 Cohort study **Strengths** Evaluation of provider perception and statistical information on treatment changes**.** **Weakness** No pre/post intervention survey. No information provided on statistical data collection methods. **Feasibility** Not generalizable. QI project specific for site where it was implemented.

Key: DV-dependent variable; EBP-Evidence Based Practice IV-independent variable; HDRS-Hamilton Depression Rating Scale; MMSE-Mini Mental State Examination N- number of studies; n-number of participants; NA-Not applicable PCP-primary care providers; QI-Quality Improvement SI- suicidal ideation; SSI-Scale for Suicidal Ideation; vs-versus;

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
Citation Bernhardsson et al., (2014) **Country** Sweden **Funding** Doctoral grant from Linköping University **Bias** None	QI project 5-step model for implementation	**Design** Nonrandomized control trial. **Purpose** Evaluate the effect of a guideline to improve practice.	**N= 425** **Demographics** Primary care physical therapists **Setting** 60 primary care clinics **Exclusion** Employed by county council **Attrition** 40%	**IV1** Treatment guideline **DV1** Provider knowledge **DV2** Attitude about guidelines	Self-report questionnaire. EpiServer survey software.	Power 80% Significance level 5% Pearson X^2 z-test SPSS	**DV1** Awareness: Intervention (59%) Control group (44%) reported (p = 0.030), Finding guidelines (40% vs. 16%; p < 0.001), Access to guidelines (26% vs. 7%; p <0.001). **DV2** Intervention group considered guideline helpful p=0.018	**Level of Evidence 3**- Nonrandomized controlled study **Strengths** Multiple clinics. **Weakness** High attrition rate. Not randomized. **Feasibility** Feasible to reproduce Not generalizable. QI project specific for site where it was implemented.
Citation Browning, M., et al. (2021) **Country** United Kingdom, Spain, Germany, France, Netherlands **Funding** European Union's Horizon 2020 research **Bias** None	QI project Affective processing bias	**Design** RCT **Purpose** Improve medication management of depressed patients	**N= 913** **Demographics** White 90% Female 62% Mean age-40 range 18-70 **Setting** Primary care clinics in 5 European healthcare systems **Attrition** 50% by 12 months	**IV1** PReDicT **DV1** Depression remission **DV2** Anxiety remission **Definition:** PReDicT-Predictive algorithm for antidepressant treatment Remission-50% reduction in symptoms	Quick Inventory of Depressive Symptoms Montgomery–Åsberg Depression Rating Scale Generalized Anxiety Disorder Assessment	Alpha two-tailed 0.05, Power 80%-establish sample size. Pre-published protocol, statistical analysis. Multilevel logistic regression, odds ratio, 95% confidence interval	**DV1:** PReDicT (55.9%) & control (51.8%) arms did not differ significantly (odds ratio: 1.18 (95% CI: 0.89–1.56), P = 0.25**)** **DV2:** PReDicT Mean change −9.70 95%CI (−10.79, −8.61) Control: Mean change −7.48 95%CI (−8.60, −6.36) 2.22 (0.74, 3.70) p=0.004	**Level of Evidence** 2 RCT **Strengths** Implemented in multiple countries. **Weakness** Algorithm sensitivity 57%. Adherence to the protocol prescribing recommendation was inconsistent in treatment group. High attrition. **Feasibility:** Feasible to reproduce Not generalizable. QI project specific for site where it was implemented.

Key: DV-dependent variable; EBP-Evidence Based Practice IV-independent variable; HDRS-Hamilton Depression Rating Scale; MMSE-Mini Mental State Examination N- number of studies; n-number of participants; NA-Not applicable PCP-primary care providers; QI-Quality Improvement SI- suicidal ideation; SSI-Scale for Suicidal Ideation; vs-versus;

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
Citation Dolan-Soto, D.R., et al. (2020) **Country** United States **Funding** Self-Funded **Bias** None	QI project utilizing a newly developed program (treatment algorithm, medication resource, and care-based learning module). Modeled after IMPACT program for depression treatment.	**Design** Post intervention survey. **Purpose-** Improve anxiety disorder recognition and treatment.	**Demographics** N=40 Residents N=18 Attending physicians **Setting** Large outpatient Primary care clinic in North Carolina; 100 providers seeing 1,200 patients	**IV1** NAMASTE protocol **DV1** Provider confidence **DV2** Anxiety diagnosis and appropriate treatment	Post intervention anonymous survey. Survey results can be assumed to be reliable and valid. Not enough information is reported to assess reliability.	Absolute values.	**Reported as % of providers that agreed with statements.** **DV1:** Improved ability to prescribe: Residents: 95% Attendings 100% **DV2:** Improved diagnosis: Residents 59% Attendings 72% Improved ability to treat: Residents 73% Attendings 77%	**Level of Evidence:** 3-Nonrandomized controlled study **Strengths** Research was performed in a large clinic. **Weakness** No control and study group. No pre implementation information. **Feasibility** Not generalizable. QI project specific for site where it was implemented.
Citation Hansoti, B., et al. (2017) **Country** South Africa **Funding** Expanded Public Works Program **Bias** Not reported	QI project Integrated Management of Childhood Illness clinical case management guideline.	**Design** Mixed methods; Direct observation, pre & post implementation chart-review **Purpose** Rapidly identify critically ill children and expedite their care.	**Observation & chart review** N= 3383 Demographics: Pediatric patients **Pre/Post chart review** N=827 Demographics: Charts had SCREEN & IMCI **Setting** Primary healthcare pediatric clinic	**IV1** SCREEN treatment algorithm **DV1** Time until critically ill patients see a provider **DV2** Accurately identified critically ill patients	Custom android app to randomly assign patient numbers. Microsoft Excel spreadsheet to track times**.**	STATA v.12-Cox-regression ANOVA	**DV1:** Screened within 5 minutes-median 84.1%, IQR 66.3%-90.3%, ANOVA R=0.2859 p<0.0001 Nurse within 10 minutes- Median 83.5%, IQR 38.8%-100%, ANOVA R= 0.3936, p<0.0001 Median time decreased from 100.3 minutes to 4.9 minutes P <.001 **DV2:** Tool sensitivity- 94.2% specificity 88.1%	**Level of Evidence** 4 cohort study **Strengths:** Large study. Calculated number needed to observe for validity. **Weakness:** No randomization. Implementation inconsistency between offices. **Feasibility** Not generalizable. QI project specific for site where it was implemented.

Key: DV-dependent variable; EBP-Evidence Based Practice IV-independent variable; HDRS-Hamilton Depression Rating Scale; MMSE-Mini Mental State Examination N- number of studies; n-number of participants; NA-Not applicable PCP-primary care providers; QI-Quality Improvement SI- suicidal ideation; SSI-Scale for Suicidal Ideation; vs-versus;

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
Citation Mendis et al., (2009) **Country** United States, China & Nigeria **Funding** Not reported **Bias** Not reported	EBP. World Health Organization treatment guidelines.	**Design** RCT **Purpose** Assess effectiveness of coronary vascular disease algorithm to reduce blood pressure.	**N= 2397** **Demographics** Age: 30-70 with blood pressure 140-179 **Setting** 10 pairs primary care offices in China & Nigeria **Exclusion** Comorbid condition that may cause secondary hypertension **Attrition** 25%	**IV1** Cardiovascular risk assessment & management algorithm **DV1** Blood pressure **DV2** Smoking cessation, BMI, eating habits	Registry, inclusion visit, follow up visit, and exit interview forms. Visual check of quality.	X^2 α, 0.05: power, interclass correlations unvaried comparison-t-test Dichotomous-Fisher exact test ANOVA	**DV1-** Median increase in target blood pressure of 16.2% (interquartile range, IQR: 10.3–32.2) and 6.0% (IQR: 1.5–17.5) **DV2**- Not significant	**Level of Evidence** 2 RCT **Strengths** **Large study.** **Weakness** Patients lost to follow up were the most ill. Likely affecting data. **Feasibility** Generalizability limited by setting.
Citation Miyar, M. E., et al. (2017) **Country** United States **Funding** Conducted by Universities. No funding information provided**.** **Bias** None	QI project Best practice guidelines and American Academy of Dermatology guidelines.	**Design** Pre and post intervention surveys **Purpose** Improve PCP knowledge on Atopic Dermatitis management.	**N=** 78 **Demographics** PCP residents and attending physicians **Setting** PCP office residency programs **Attrition** 30%	**IV1** Atopic dermatitis treatment algorithm **DV1** Provider knowledge **DV2** Perception of algorithm usefulness	Multichoice knowledge assessment and survey	Analysis of covariance ANCOVA	**DV1**- 1.19 points higher on average on the posttest (b = 1.19 [95% confidence interval 0.07, 2.32], p = 0.04) **DV2-** Intervention group participants- 89% would use algorithm for AD	**Level of Evidence** 2 RTC **Strengths-**Conducted in multiple states. High level of research**.** **Weakness** Small sample size. Possible cross-education. Control and intervention worked in the same office. **Feasibility S**implicity of resources increases feasibility. Not generalizable. QI project specific for site where it was implemented.

Key: DV-dependent variable; EBP-Evidence Based Practice IV-independent variable; HDRS-Hamilton Depression Rating Scale; MMSE-Mini Mental State Examination N- number of studies; n-number of participants; NA-Not applicable PCP-primary care providers; QI-Quality Improvement SI- suicidal ideation; SSI-Scale for Suicidal Ideation; vs-versus;

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice/ Generalization
Citation (Srivastava et al., 2019) **Country** United Kingdom **Funding** National Institute of Health Research	EBP Care pathway	**Design** Pre and post implementation comparison **Purpose** Improve appropriate diagnosis of non-alcoholic fatty liver disease & decrease inappropriate referrals	**N=** 3,012 **Demographics** Adult primary care patients with new nonalcoholic fatty liver disease diagnosis **Setting** Primary care clinics	**IV1** Nonalcoholic fatty liver disease algorithm **DV1** Inappropriate referrals **DV2** Appropriate referrals	Electronic patient records identified with reports by diagnosis and use of algorithm then reviewed individually by research team.	SPSS, odds ratio, 95% Confidence intervals, chi-square tests	**DV1** Detected 5 times more cases of advanced fibrosis and cirrhosis (odds ratio [OR] 5.18; 95% CI 2.97–9.04; p <0.0001) **DV2** improved clinical judgement-reduced unnecessary referrals to secondary care by 81% (OR 0.193; 95% CI 0.111–0.337; p <0.0001)	**Level of Evidence 4** Cohort study **Strengths** Large study. Implemented in real-world setting **Weakness** No randomization or blinding **Feasibility** Feasible to implement. Generalizable in Primary care clinics.

Key: DV-dependent variable; EBP-Evidence Based Practice IV-independent variable; HDRS-Hamilton Depression Rating Scale; MMSE-Mini Mental State Examination N- number of studies; n-number of participants; NA-Not applicable PCP-primary care providers; QI-Quality Improvement SI- suicidal ideation; SSI-Scale for Suicidal Ideation; vs-versus;

Appendix B

Table 2

Synthesis Table

Author	Alexopoulous	Amin	Aminsharifi	Bernhardsson	Browning	Dolan-Soto	Hansoti	Mendis	Miyar	Srivastava
Year	2009	2020	2018	2014	2021	2020	2017	2009	2017	2019
LOE	2-RCT	4-Cohort	4-Cohort	3-NRCT	2-RCT	3-NRCT	4-Cohort	2-RCT	2-RCT	4-Cohort
Framework										
QI	X	X	X	X	X	X	X		X	
EBP								X		X
Setting	PCP office	PCP office	PCP office	PCP office	PCP office	PCP office	PCP office	PCP office	PCP office	PCP office
Population										
Patients	X		X		X		X	X		X
Providers	X	X	X	X		X			X	
Data type										
Subjective symptoms	X	X			X	X				
Physiologic medical			X	X			X	X	X	X
Data collection method										
Survey		Pre/post	Post	Post		Post			Pre/Post	
Interview	X						X			
Screening score				X	X					
Chart review			X			X	X	X		X
Intervention										
Algorithm/ Decisional tool	X	X	X	X	X	X	X	X	X	X
Med guide		X			X	X			X	
Patient Outcomes										
Appropriate Treatment		↑	↑			↑	↑			↑
Appropriate Referrals										↑
Symptoms	↓				↓					
Outcomes	↑				↑		↑	↑ NS		
Provider Outcomes										
Knowledge		↑		↑		↑			↑	
Confidence		↑	↑			↑				
Treatment Practice	↑	↑		↑		↑			↑	

Key: EBP-Evidence Based Practice; LOE- Level of Evidence; NRCT- Nonrandomized control trial; NS- Not Significant QI-Quality Improvement; RCT- Randomized control trial