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Assessing implementation strategy reporting in the mental health literature: A narrative review

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Abstract

Inadequate implementation strategy reporting restricts research synthesis and replicability. We explored the implementation strategy reporting quality of a sample of mental health articles using Proctor, Powell, & McMillen's (2013) reporting recommendations. We conducted a narrative review to generate the sample of articles and assigned a reporting quality score to each article. The mean article reporting score was 54% (range 17%-100%). The most reported domains were: name (100%), action (82%), target (80%), and actor (67%). The least reported domains included definition (6%), temporality (26%), justification (34%), and outcome (37%). We discuss limitations and provide recommendations to improve reporting.

Keywords

Implementation strategies; reporting; mental health

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Availability of data and material

Data available on request from the authors

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Background

Implementation science is “the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice” (Eccles & Mittman, 2006, p. 1). This burgeoning field has made substantial progress over the past ten years (Academy Health, 2017; SIRC, 2017). There are now implementation-specific conceptual models and frameworks which elucidate key determinants of the uptake of new practices (Tabak, Khoong, Chambers, & Brownson, 2012). Researchers have categorized implementation strategies, i.e., techniques that increase the likelihood of the uptake and sustainment of practices (Proctor, Powell, & McMillen, 2013), into accessible taxonomies (Powell et al., 2015). There are implementation-specific outcomes (Proctor et al., 2011) and numerous measures to assess them (Lewis et al., 2015). However, inadequate implementation strategy reporting has hampered the progress of this emerging discipline (Bunger et al., 2017; Leeman et al., 2015; Lokker, McKibbin, Colquhoun, & Hempel, 2015; Nadeem, Olin, Hill, Hoagwood, & Horwitz, 2013; Powell, Proctor, & Glass, 2014; Proctor, Powell, & McMillen, 2013).

Researchers have noted incomplete specification of implementation strategies within the literature (Bunger et al., 2017; Leeman et al., 2015; Lokker, McKibbin, Colquhoun, & Hempel, 2015; Nadeem et al., 2013; Pinnock et al., 2017; Powell et al., 2014; Proctor et al., 2013). Just as insufficient reporting of clinical interventions impedes knowledge synthesis, inconsistent or imprecise implementation strategy reporting limits replicability and impedes the accumulation of implementation knowledge by limiting the usefulness of subsequent meta-analyses and systematic reviews (Bunger et al., 2017; Leeman et al., 2015; Lokker, McKibbin, Colquhoun, & Hempel, 2015; Moher, Altman, Schulz, Simera, & Wager, 2014; Nadeem et al., 2013; Powell, Proctor, & Glass, 2014). Enhanced reporting promotes scientific transparency and clarity (Schulz et al., 2010). Implementation researchers, therefore, have called for improved reporting (Pinnock et al., 2017; Powell et al., 2018; Proctor et al., 2013; Wilson et al., 2017). The benefits of improved reporting would extend beyond the realm of research, as consistent and detailed reporting of implementation strategies would help organizations apply the strategies in their efforts to incorporate evidence-based practices.

One method to enhance reporting is for authors to adhere to an agreed upon reporting guideline (Equator Network, 2018; Moher, Schulz, Simera, & Altman, 2010; Pinnock et al., 2017; Simera et al., 2010; Wilson et al., 2017). Reporting guidelines define both the type and minimum amount of information needed to maximize the rigor and replicability of the study’s findings (Altman & Moher, 2014; Michie, Fixsen, Grimshaw, & Eccles, 2009; Simera et al., 2010). These guidelines are often structured as checklists, flow diagrams, or templates. Researchers have developed hundreds of reporting guidelines covering a plethora of study design types (Equator Network, 2018; Simera et al., 2010).

The Consolidated Standards of Reporting Trials (CONSORT) is an example of one such guideline (Schulz, Altman, Moher, & CONSORT Group, 2010). The CONSORT includes a checklist and flow diagram to aide in the transparent reporting of randomized control trials

(Schulz et al., 2010). The 25-item checklist is divided into sections (e.g., title and abstract, introduction, methods) with nested guidance under each section (e.g., include “eligibility criteria for participants”) (Schulz et al., 2010, p. 699). In addition to the checklist, researchers populate a flow diagram template which tracks study participants from enrollment to analysis (Schulz et al., 2010). The purpose of these guidelines is to facilitate “clarity, completeness, and transparency of reporting” (Schulz et al., 2010, p. 698), and evidence suggests it does (Moher, Jones, Lepage, & CONSORT Group, 2001; Moher, Stewart, & Shekelle, 2016; Turner, Shamseer, Altman, Schulz, & Moher, 2012).

Adhering to the CONSORT reporting guidelines facilitates rigorous reporting (Moher, Jones, Lepage, & CONSORT Group, 2001; Moher, Stewart, & Shekelle, 2016; Svenkerud & MacPherson, 2018; Turner, Shamseer, Altman, Schulz, & Moher, 2012). In fact, in their pre/post analysis of journals which have adopted the CONSORT reporting guideline, Moher et al. (2001) found that using the guidelines led to greater reporting. A systematic review of over 16,000 randomized control trials discovered that CONSORT-endorsing journals showed improved reporting across multiple domains (Turner et al., 2012).

There are dozens of systematic reviews assessing reporting quality using various reporting guidelines (Samaan et al., 2013). However, we found no clear guidance in the literature about when reporting should be assessed using a guideline relative to the publication of the guideline (Samaan et al., 2013; Svenkerud & MacPherson, 2018). Randomized control trial reporting, for example, has been assessed using the CONSORT guidelines (Bath, Owen, & Bath, 1998; Samaan et al., 2013). Those guidelines were originally published in 1996 (Begg et al., 1996). Researchers used the CONSORT guideline to assess the literature as soon as two-years post-guideline publication and their assessment of the literature included articles pre-dating the publication of CONSORT (Bath, Owen, & Bath, 1998; Samaan et al., 2013). In addition to not finding guidance as to when a guideline could/should be used to assess the literature, we found no consistent manner for scoring guideline adherence (Samaan et al., 2013; Svenkerud & MacPherson, 2018). We seek to apply an implementation strategy reporting recommendation to systematically assess the reporting quality of the mental health implementation literature.

Proctor, Powell, & McMillen (2013) developed recommendations to improve the reporting of implementation strategies. Their nine-item checklist includes the following domains: name, definition, actor, action, action target, temporality, dose, implementation outcome affected, and justification (Proctor et al., 2013). They encourage researchers to leverage published taxonomies (e.g., Powell et al., 2015) to name and define the strategies with the aim of improving concept harmonization with the broader literature. To operationalize the strategies, they advise that researchers describe who is delivering the implementation strategy (actor), the steps taken in delivering the strategy (action), who the recipient of the strategy is (unit of analysis), and which conceptual target is being influenced (action target). In addition, they recommend that researchers describe when they executed the strategy (temporality) and how much of the strategy the researchers provided (dosage). Ultimately, these efforts should explicitly identify which implementation outcomes the strategies target (implementation outcome affected), and researchers should offer a justification for the

strategy they selected (justification). This guideline has not been employed to systematically assess the reporting quality of the mental health implementation literature.

Our study provides guidance on scoring the reporting of implementation strategies. Implementation science is a relatively young scientific discipline (Eccles & Mittman, 2006). Other implementation researchers have documented problems with implementation strategy reporting generally (Bunger et al., 2017; Leeman et al., 2015; Lokker et al., 2015; Pinnock et al., 2017; Powell et al., 2014; Proctor et al., 2013). Addressing reporting early in the discipline's development could have long-lasting effects. While the aforementioned studies have documented inadequate implementation strategy reporting, they have not adopted the practice of using reporting guidelines and scoring methods to assess articles, as has been done in other disciplines (Samaan et al., 2013).

Given the recent establishment of implementation strategy reporting guidelines (Albrecht, Archibald, Arseneau, & Scott et al., 2013; Hoffman et al., 2014; Pinnock et al., 2017; Proctor et al., 2013) and implementation strategy tracking (Boyd, Powell, Endicott, & Lewis, 2018; Bunger et al., 2017;) in relation to the life cycle of research projects, we thought that it may be premature to expect compliance with the recommendations. However, following the precedent set by others (Moher, Jones, Lepage, & CONSORT Group, 2001; Moher, Stewart, & Shekelle, 2016; Samaan et al., 2013; Svenkerud & MacPherson, 2018; Turner et al., 2012), we think it reasonable to apply a scoring method to a sample of articles based on a reporting guideline to provide guidance to the discipline on reporting more broadly.

This current report seeks to address this gap in the mental health implementation literature through the following aims: (1) apply a scoring approach based on Proctor et al.'s (2013) reporting recommendations to a sample of implementation-related mental health articles, (2) describe the degree of reporting completeness of the sample of articles, (3) provide recommendations for improving implementation strategy reporting according to the guideline domains, and (4) as an exploratory aim, describe reporting scores over time.

Methods

We used a narrative review approach to capture a meaningful sample of articles to apply our scoring scheme to. Our review does not cover the breadth of literature to be considered a scoping review, but we did apply Arksey & O'Malley's (2005) five steps to organize our procedures and this paper. The five steps include: (1) identify the research questions, (2) identify the relevant studies, (3) study selection, (4) chart the data, and (5) collate, summarize and report results (Arksey & O'Malley, 2005; Levac et al., 2010). Other implementation strategy reporting studies have used these steps (Lokker et al., 2015; Slaughter, Hill, & Snelgrove-Clarke, 2015). This section will describe steps two through four, and the results section will report step five.

Identify the relevant studies

The medical librarian on our team developed the search strategy in consultation with the other authors. Due to the breadth of implementation-related terms (McKibbin et al., 2010), the complexity of search results these terms produce, and our aim to extract a meaningful

sample rather than a comprehensive set of articles, we narrowed our search approach by using targeted implementation terms and focused on mental health interventions and mental health outcomes. This search focused on implementation strategies because they are conceptually distinct from interventions (Proctor et al., 2009) and critical for the uptake of new practices. The search was narrow, as it was intended to capture articles that specifically report “implementation strategies”. Narrowing an initial search strategy to apply a scoring approach has been done by others within implementation science (Slaughter, Hill, & Snelgrove-Clarke, 2015).

The search was also limited to mental health. Three factors led us to focus on strategies for implementing mental health interventions. First, implementation science has a growing and readily identifiable literature base, due in large part to the early and active support of the National Institute of Mental Health to the field of implementation science. Second, unlike physical care in medicine which benefits from widely available electronic medical records for tracking implementation of drug therapies and procedures, mental health services rely heavily on psychosocial interventions which are implemented through training, facilitation, and learning collaboratives. Psychosocial interventions are complex, and the implementation challenges they present are quite different from those in medicine. Third, issues of feasibility required us to limit our search.

The final search strategy included three domains: implementation strategy (e.g., implementation strateg*, implementation research), mental health treatment (e.g., counseling, psychotherapy, intervention, therapy), and evaluation (e.g., hybrid design, evaluation study) (see Additional file 1 for our full search strategy).

In February 2017, the librarian conducted our initial systematic search using the strategy in Embase 1947-, OVID Medline 1946-, Academic Search Complete 1887-, and PsycINFO 1800s-. We limited the search to articles published in English using database-supplied limits.

The librarian exported the results to EndNote version X8.2. The initial search generated 3,153 unique citations. The librarian reran the search strategy in June 2019 limiting results to 2017 through 2019 to capture articles since the initial search. This search update yielded an additional 1,324 unique citations. Seven of those citations appeared and were screened in our first search. The final yield for the search update for new, unique citations was 1,317, making the total number of unique citations from both searches 4,470.

Study selection

We applied four inclusion/exclusion criteria throughout the study selection process. First, the articles needed to report efforts on implementing a mental health intervention. We excluded articles that did not report any mental health intervention and efficacy- or effectiveness-only articles. Second, included articles reported a mental health outcome. We excluded articles that reported physical health, substance abuse, dual diagnosis, cognitive impairment, or personality disorder outcomes. This means that articles with a mental health outcome and a secondary outcome (e.g., substance abuse, physical health) were excluded. Third, the article needed to be published after 2006, when implementation science was, in many ways, galvanized into a discipline (Eccles & Mittman, 2006). The final sample included articles

between 2006 to 2019. Proctor et al. (2013) published their implementation strategy reporting recommendations at the midpoint of our sample. The scores across this 13-year time horizon (2006 to 2019) provide an exploratory pattern of quantified implementation strategy reporting. Finally, we included only empirical articles. We excluded literature reviews and other non-empirical work (e.g., editorials).

We screened the titles, abstracts, and full-texts applying the aforementioned inclusion/exclusion criteria. All reviewers received training in screening methods from an expert in systematic review methods and consulted with an implementation strategy expert on conceptual issues. Reviewers calibrated their application of the inclusion/exclusion criteria through initial joint discussions using a sub-sample of articles. The third author screened article titles and a second author resolved any questions for the first search, and the first author reviewed article titles for the search update. If there were any questions during the search update title screening, we advanced the articles to abstract screening. We excluded articles during title review if they indisputably met one of the exclusion criteria (Hickey et al., 2017). Others have shown that reviewing titles separately from abstracts can be more efficient and no less accurate (Mateen, Oh, Tergas, Bhayani, & Kamdar, 2012). We reviewed the titles of 4,470 articles (3,153 from the first search, and 1,317 from the search update) and excluded 3,953 of these articles. We divided the remaining articles (N=517) among the first three authors for abstract review. Two authors independently screened each abstract. We excluded another 349 articles during abstract review. Finally, two authors independently screened the full-text of 168 studies. We excluded an additional 87 studies during full-text review, resulting in the final sample of 81 studies (see PRISMA diagram in Figure 1). During the screening process, screeners discussed and resolved any discrepancies. In the event that screeners were unable to resolve the discrepancy, a third screener would arbitrate the decision (Hickey et al., 2017).

Chart the data

We created an extraction spreadsheet based on the Proctor et al.'s (2013) implementation strategy reporting recommendations (see Table 1). We selected the Proctor recommendations because they specifically focus on implementation strategies and because they have been used both prospectively and retrospectively to specify implementation strategies (Boyd et al., 2018; Bunger et al., 2017; Gold et al., 2016; Hickey et al., 2017; Perry et al., 2019). The reporting recommendations include nine domains: the name of the implementation strategy, the definition of the strategy, the actor, the action, the action target, temporality (when the strategy is used), dose, the targeted implementation outcome, and the justification for the chosen strategy (Proctor et al., 2013). These domains occupied columns in the extraction spreadsheet and the rows represented distinct implementation strategies reported by each study. The extractors populated each row by identifying a strategy within a study and tracking the article's reporting of each domain of the given strategy. If a domain was not reported for a strategy, we marked that cell as missing. Two authors independently coded each article. The coders discussed and resolved any discrepancies. If the coders were unable to resolve a discrepancy, a third coder would arbitrate the decision.

After extracting the data, we created a scoring procedure to facilitate cross-study comparisons. Others have used scoring procedures to compare implementation study reporting practices (Hickey et al., 2017; Slaughter et al., 2015). Our scoring procedure generated a reporting recommendation adherence score for each article (Hickey et al., 2017). The score ranges from 0% to 100%. A 100% score means the study provided information for each reporting domain for each strategy. We also created a domain-specific adherence score for the total sample of articles. In this case, a score of 100% means that each article in the sample was fully compliant with reporting domain recommendations.

We created the individual article score by constructing a proportion. We created the denominator by counting the number of strategies the article reported and by multiplying that number by the nine domains. This value represented an article reporting 100% of the domains. Therefore, if a study used five strategies, the authors would need to report all nine domains for each of the five strategies to get a score of 100% (5 strategies X 9 domains = 45). The numerator reflects the number of domains reported in the article. In this example, if the authors reported only 15 dimensions, their adherence score would be 33% (15 reported dimensions / 45 expected dimensions).

We used a similar approach to create the domain-specific score for the sample of articles. The denominator represents the total number of implementation strategies reported by the sample of articles. A domain could receive a score of 100% only if each of the strategies from the sample was reported using domain-specific descriptions. For example, a sample of articles with 100 strategies reported would ideally include 100 detailed descriptions per domain. The numerator represents the number of strategies successfully reported using domain-specific descriptions. Therefore, if only 50 of the 100 strategies in the sample reported definitions, the definition domain score would be 50% (50 strategy definitions reported / 100 expected definitions). We calculated both scores in an Excel spreadsheet.

Next, we extracted information about other variables of interest (see Table 1). The first variable of interest was whether the study was a protocol paper and the second was whether the researchers used a hybrid design. Protocol papers offer more space for methodological details such as implementation strategy reporting than other publication types. Hybrid study designs have an explicit implementation strategy focus (Curran et al., 2012). Type 2 and type 3 designs have an even greater focus on implementation strategies, as they include measures of both clinical and implementation outcomes (Curran et al., 2012). Given the explicit focus on implementation strategies and outcomes in these designs, we imagined that these study designs could influence strategy specification.

Results

We list the extracted articles in Table 2 and report the summary statistics for the extracted studies in Table 3. Most of the studies were published after 2013 (80.2%). Approximately 30% of the studies were protocol papers. And 33.3% of the studies used a hybrid design. Among the hybrid studies, type 1 accounted for 12.3% and type 2 accounted for 14.8% of the studies, while only 6.2% of the studies were hybrid type 3. On average, each article reported using 4.3 strategies (*Median*=3.0, *SD*=2.8).

Mental health implementation strategy reporting practices

We summarize the descriptive statistics for the individual article reporting adherence scores in Table 3. The median individual adherence score was 51.9% ($M=53.9\%$, $SD=15.7$). The sampled articles are reporting, on average, approximately half of the domains specified in the reporting recommendations. The scores range from 17.5% to 100%. The most reported domains were name (100%), action (82.2%), action target (80.5%), and actor (67.2%). The least reported domains included definition (6.0%), temporality (25.6%), justification (33.6%), and outcome (37.1%) (see Figure 2 for domain-specific scores).

The strategy name was the most frequently reported domain. The perfect score in this category is a function of our extraction method and scoring decisions. To track the reporting of a strategy, first we had to discern that the authors were deploying a strategy. If we could identify a strategy, we counted it as being named. Many articles did not use implementation strategy labels from existing taxonomies (e.g., Powell et al., 2015) but used terms that were sufficiently discernable. For instance, rather than labeling a strategy as “conduct educational meetings” (Powell et al., 2015), the authors might list “educational outreach”. Or rather than say “audit and feedback” (Powell et al., 2015), the article could use terms like “performance feedback”. We had to familiarize ourselves with the implementation strategy taxonomies to ensure that we were discerning strategies which were not explicitly identified as implementation strategies. Nielsen, Slinning, Oddil, & Drozd (2018) provided an example of how they used the strategy names from the ERIC taxonomy (Powell et al., 2015). They made a table where they listed name of the strategy per the ERIC taxonomy along with its conceptual definition.

The next most frequently reported domain was action (82.2%). Action refers to the steps involved in employing the strategy, which are expressed as verb(s) describing *what* the implementers did (Proctor et al., 2013). The extent to which studies provided detailed descriptions of their strategy procedures varied greatly. Those articles with higher “action” scores often provided detail in how they described their training protocols (e.g., content, tools), the content of static strategies (e.g., educational materials), their technical assistance procedures, and so on. Rather than report that they used “training” (low degree of detail), these articles would add information about training content and pertinent teaching modalities (e.g., didactic, skill demonstration, role-plays) (Cully et al., 2010; Egeland et al., 2017; Granholm et al., 2014; Hermens et al., 2015; McCabe et al., 2014; Mignogna et al., 2014; Nielsen et al., 2018; Starin et al., 2014). Similarly, greater detail of static strategies included their form (e.g., pamphlet) as well as information about their content (e.g., key components of the intervention procedures). For strategies like supervision, greater detail included the supervisors’ actions (e.g., review audio tapes, provide suggestions, demonstrate skills, role-play skills) rather than solely mentioning that they provided supervision. Those articles with the most detailed actions presented them in tables (Egeland et al., 2017; Nielsen et al., 2018) or used sub-headers in the body of the paper (e.g., Egeland et al., 2019; Haynes et al., 2018).

The next domain was action target (80.5%). Action targets include conceptual targets of action (e.g., knowledge about intervention) and the unit of analysis (e.g., frontline clinicians). With the exception of one article, researchers in the current sample of articles reported whom the strategy targeted (unit of analysis) rather than the conceptual target.

These articles specified that the strategy targeted peer mentors, community-based therapists, health specialists, supervisors, site leadership, and others. Egeland et al. (2017) reported conceptual targets like provider motivation, knowledge, and skills. Few authors in this sample of studies explicitly articulated conceptual targets. This pattern identifies a key area of opportunity for the implementation literature.

The actor refers to the individual(s) delivering the strategy (Proctor et al., 2013). Articles in this sample reported the actor for 67.2% of the strategies. Unless specified, it might be assumed that the actor is the team authoring the study. However, as others pointed out in their actor identification, a study may use a variety of actors (Egeland et al., 2017; Nielsen et al., 2018). For instance, intervention developers provided the initial training and the external implementation team supported the initiation of leadership (Egeland et al., 2017). In other cases, the actor may be supervisors or technical assistance workers from government agencies (Nielsen et al., 2018). These variations underscore the importance of explicitly stating who is performing the strategy, even if the study team is primarily executing the strategy. Considering the perspective of organizations and agencies which may use these strategies, it would be important for them to know whom they would need to contract or partner with to deploy the strategy. Furthermore, knowing what prerequisite training, knowledge, or experience the actor needs would help organizations in their implementation planning (e.g., does the agency need to contract with the treatment developers to provide the training?).

Dose refers to how much of the strategy is dispensed to the action targets. The sample of articles reported the dose more than half of the time (54.9%). Some researchers operationalized dose by describing the frequency of the strategy. For example, Cohen et al. (2016) explained that their different training options took one day, 10 hours, and 2 days and that the consultation dose was two calls per month over a 12-month period. (Cohen et al., 2016). Similarly, Egeland et al. (2017) reported their audit and feedback strategy dose was the first session of every module, their outcome monitoring strategy occurred after each module, and their process-monitoring and feedback strategy included two sessions which occurred after 6 months and 12 months of implementation (temporality). For certain strategies, like distribute educational materials, dose was very rarely reported. It may be that in certain cases, the authors believe that the strategy dose is assumed, as this strategy is likely to occur only once (e.g., distributing a manual) or to be counted as one unit (e.g., conducting a needs assessment). Nielsen and colleagues (2018) delineated the dose even in those circumstances under which it might have been implied. In reporting the “distribute educational materials” strategy, for example, the authors specified that the trainees received the materials once (Nielsen et al., 2018). Operationalizing dose aids our understanding of the degree of strategy intensity necessary to observe changes in implementation outcomes.

Researchers named which implementation outcome(s) the strategies targeted 37.1% of the time. This particular domain was the most difficult to score. The reporting recommendations state that strategies should be explicitly tied to an implementation outcome. As such, the clearest studies to score in this domain were those that specified which outcomes matched each strategy. For example, Egeland et al. (2017) and Nielsen et al. (2018) itemized their strategies and specified the outcome for each strategy using the implementation outcomes

developed by Proctor and colleagues (2011). The next category of studies which were more easily scored were those studies that did not report an implementation outcome at all. These studies were easier to score objectively, as they would not receive credit for reporting in this case. A third category of studies explicitly tied an implementation outcome to multiple implementation strategies (Cully et al., 2012; Lewis et al., 2015). In these instances, the authors clearly indicated that each strategy was intended to influence the stated implementation outcome. The most difficult category of articles to score were those that mentioned one or even multiple outcomes but did not explicitly link them to the strategies. In those cases, it was difficult to discern if the authors hypothesized that all of the strategies would influence all of the outcomes. The “outcomes” score would have been higher if we had included such studies. Furthermore, the score would have been higher if we would have included outcomes beyond implementation outcomes (Lewis, Klasnja, et al., 2018; Proctor et al., 2011).

The justification domain score, the rationale for selecting the implementation strategies, was 33.6% for the sample of articles. The justification offers “the why” behind selecting a given strategy. The rationale could be based on empirical or theoretical literature or for pragmatic reasons (Proctor et al., 2013), as such, there were variations in how researchers reported justification. For example, Lewis et al. (2015) used various types of rationale to support their strategy selection. Rationale included relevant empirical and theoretical research, pilot data, and pragmatic feedback from stakeholders (Lewis et al., 2015). Others provided primarily theoretical support by anchoring their strategy decisions to a conceptual framework (Mignona et al., 2014). Some authors supported their selections by citing relevant research (Hermens et al., 2014; Nielsen et al., 2018). Each of these methods builds upon the existing knowledge base and encourages researchers to select the best fitting strategies.

Reporting of temporality – when implementers deployed the strategy – was largely missing in this sample of articles (25.6%). Among the articles reporting temporality, researchers operationalized this domain in several ways. Some researchers reported temporality as a sequence of strategies. Lewis and colleagues (2015) articulated the flow of their strategy deployment by specifying their sequence: embed PhQ9, needs assessment, initial training, set guidelines, form implementation team, and conduct tri-weekly group meetings. Others expressed temporality in relation to the implementation phase (e.g., preparation, implementation, maintenance) laid out by an implementation framework (Egeland et al., 2017). Some researchers expressed temporality by specifying when one strategy was employed in relation to another strategy (e.g., a strategy beginning one month after a different strategy) (Cucciare et al., 2016). Others reported the temporality in relation to a milestone in the implementation project (e.g., audit and feedback begins after the provider receives clients) (Nielsen et al., 2018). These approaches all convey when the strategy was deployed an important component to consider, particularly for causal modeling.

The definitions (6.0%) of implementation strategies were rarely articulated in this sample of articles. Providing a conceptual definition of a strategy is distinct from operationalizing it (Proctor et al., 2013). A conceptual definition provides a “general sense of what the strategy may involve” and aids readers in discerning whether the definition is in line with its usage in the larger literature (Proctor et al., 2013). Conceptual definitions were largely absent in this

sample and, when included, were generally not based on a published taxonomy. Few studies modeled how to include conceptual definitions. For example, Norona & Acker (2016) defined learning collaborative as, “LCs bring together multiple ‘teams’ of providers, supervisors, and administrators from different agencies to create a supportive network within which to share ideas, troubleshoot difficulties, and model successful implementation strategies” (p. 704). Nielsen and colleagues (2018) made a table that used the ERIC implementation strategy name and conceptual definition (Powell et al., 2015). Naming the conceptual definition helps demonstrate to readers how the article aligns with the broader literature.

We observed changes in reporting scores over time (see figure 3). Observing these changes should be considered exploratory, however, because our examination of the data is purely descriptive and the sample size for the earlier years in our date range was very small. The first few years (2007, 2009, and 2010) in the figure only had one study each, making the adherence score for those years solely dependent on one article’s performance. This is in stark contrast to the 18 studies in 2018. The increase in studies over time may be the result of increased visibility and interest in Implementation Science. Since 2013, the reporting adherence scores have increased each year. In 2013, the average adherence score was 43.7% and in 2018 the score was 66.0%. The largest increase was between 2016 (47.8%) and 2017 (59.5%). With only 6 months’ worth of articles for 2019, the average adherence score is 58.6%. The trend line shows an increase in scores over time.

Discussion

The results of our analysis suggest several implications. First, our results confirm previous findings that indicate inadequate implementation strategy reporting in the mental health literature (Bunger et al., 2017; Leeman et al., 2015; Lokker et al., 2015; Powell et al., 2014). Similar reporting difficulties have been found in other substantive areas within implementation science (Hickey et al., 2017). We noted a paucity of reporting detail in the studies in our sample, in which only one study fully adhered to the reporting recommendations. This lack of detail is a threat to future literature synthesis, study replication, theory building, causal modeling efforts, and hinders the ability of organizations to employ the strategies in real-world settings (Bunger et al., 2017; Lewis, Klasnja, et al., 2018; Lokker et al., 2015; Moher et al., 2014).

Second, this study contributes to improved implementation strategy reporting by delineating the most and least frequently reported domains. The action, target, and actor were the most consistently reported dimensions of the implementation strategies. This pattern is promising, as the replication of the strategies in future studies hinges on the explication of these characteristics. However, it should be noted that our scoring procedures credited studies for reporting the target if they described the unit of analysis (e.g., frontline providers) *or* the conceptual target (e.g., knowledge). Target scores in our sample were almost exclusively connected to the unit of analysis. Reporting the intended mechanisms (conceptual targets) will support the theoretical work that implementation science sorely needs (Lewis, Klasnja, et al., 2018). Without these conceptual targets, implementation science will not be able to

generate predictive theories (Lewis, Klasnja, et al., 2018). While reporting these characteristics is helpful, critical areas for improvement remain.

The least frequently reported characteristics were strategy definition, justifications for the selected strategies, temporality, and which specific implementation outcome the strategies were intended to influence. A similar pattern has been described by others (Leeman et al., 2017). Defining the strategy using existing definitions supported by the literature provides clarity and avoids concept drift in the literature (Proctor et al., 2013). At this relatively early stage of building an empirical base of knowledge about strategy effectiveness, clearly defining and naming strategies is a priority. Implementation science is home to many competing terms (Coloquhoun et al., 2014; Proctor et al., 2009); therefore, authors could advance terminology harmonization by consistently “naming” strategies. Using the name and definition of implementation strategies is more feasible given the publication of strategy taxonomies (Powell et al., 2015; Powell et al., 2012). Failure to clearly define the strategy using terms based on established taxonomies thwarts the development of a cumulative knowledge base about the effectiveness of various strategies in different contexts. Similarly, it is important for researchers to provide theoretical or empirical justification for the strategies used, as this enhances the findings of previous research.

Finally, reporting a clear link between the strategy and the implementation outcome of interest builds evidence about the causal pathways of implementation strategies. It is not possible to execute causal modeling without clearly specified outcomes and causal mechanisms. Implementation science lacks testable explanations and Lewis, Klasnja, and colleagues (2018) suggest the one of the key steps to producing predictive, testable explanations in implementation science is to identify both the proximal and distal outcomes. Lacking specified outcomes is hampering progress towards building causal explanations in implementation science (Lewis, Klasnja, et al., 2018).

While each of these characteristics is important, different types of stakeholders may also have differing reasons for prioritizing improved reporting of certain characteristics over others. Harmonization and other aspects of reporting detail are essential to building a generalizable science; therefore, implementation researchers are likely to prioritize clarity in defining and naming strategies. As implementation researchers focus on testing strategies related to implementation, service systems, and clinical outcomes, they are more likely to prioritize identifying a clear link between the strategy and outcomes of interest, which plays a central role in mapping and testing mechanisms of change. Implementation practitioners, such as coaches, facilitators, and agency administrators, are more likely to focus on details such as actor and dose. These components play a central role in decision-making related to the financial and time-costs associated with employing particular strategies (e.g., training, workload adjustment).

A third implication, the highest-scored article in this review used a table to describe the components of their implementation strategies (Nielsen et al., 2018). Others have used tables as tools for reporting their strategies both prospectively and retrospectively (Bunger et al., 2017; Gold et al., 2016; Perry et al., 2019). We recommend that researchers populate such a table and include it as a key supplemental/additional file to their manuscripts (see additional

file 2 for an example). The rows would represent the discrete implementation strategies and the columns would represent the nine reporting dimensions. The table could quickly be assessed by reviewers and would uniformly provide other researchers with the detail needed to reproduce strategies and synthesize findings across studies without depleting word counts.

The existence of reporting recommendations alone does not advance reporting (Lokker et al., 2015; Turner et al., 2012). For example, while journal endorsement of the CONSORT reporting guideline is associated with more consistent reporting (Moher et al., 2016; Turner et al., 2012), the within-journal reporting gains are inconsistent due to varying degrees of guideline adherence (Turner et al., 2012). To address this, some journals already require authors' adherence to a guideline (EQUATOR, 2019; Implementation Science, 2019).

Ideally, researchers would prospectively select an appropriate reporting guideline and submit documentation of this as part of their manuscript submission (Wilson et al., 2017). There are a few reporting guidelines that could be used for implementation strategies (Albrecht et al., 2013; Hoffman et al., 2014; Pinnock et al., 2017; Proctor et al., 2013). In this manuscript, we have described Proctor et al.'s (2013) recommendations in detail. However, there are alternative guidelines, such as the TiDieR (Hoffman et al., 2014), and WIDER (Albrecht et al., 2013), that could be adopted for implementation strategy reporting, while the StaRI (Pinnock et al., 2017) offers guidance on reporting the components of an implementation study in general. The use of any of these three frameworks would improve reporting.

While this study clarifies and expands upon previous research regarding implementation strategy reporting using a novel scoring scheme to quantify adherence, we acknowledge challenges and limitations to our approach. Implementation strategy language is not consistent, with wide heterogeneity in strategy labeling and lack of detail in the definitions. Our review focuses on this very issue, this inconsistency makes it difficult to ensure that our search strategy captured all relevant studies. Our search also did not include a number of implementation-related terms that may have yielded a larger sample size. Our intent was to capture a meaningful sample of articles. Also, we excluded studies reporting dual-diagnoses and/or non-mental health outcomes. Broad heterogeneity in implementation strategy reporting highlights a challenge to data extraction. We took measures to reach consensus between each pair of coders during the extraction process; however, it is possible that we did not detect some of the strategies or their dimensions. We acknowledge that we did not quantify inter-rater reliability and instead used a deliberation and consensus approach to address coding differences.

We also recognize limitations related to scoring decisions. For example, we decided that to receive a score for the implementation outcome domain, the author needed to explicitly state which outcomes were linked to the strategy, rather than a general reporting of the implementation outcome as the aim of the paper. Action target could be the conceptual target or the unit of analysis (Proctor et al., 2013). All the articles which received credit for reporting the action target, except for one, reported the unit of analysis. Furthermore, our scoring approach did not differentiate level of detail within a particular domain. If a manuscript offered information that made the reporting domain discernable, we scored that manuscript as complying with the recommendation.

Future work should explore ways of differentiating the extent of reporting detail to add greater nuance to reporting scores. For example, an article could receive an initial score for discernably reporting a particular recommendation component, as well as a second score that rates the amount of detail offered in the description. By incorporating additional factors into scoring, as recommended by Leeman and colleagues, future work could aid those seeking to put strategies into action (Leeman et al., 2017). For example, identifying the cost of specific strategies would aid those seeking to put strategies into action. Where exact implementation costs are unavailable, characteristics of actor, action, dose, and temporality may be used to estimate cost. Future work might also consider scoring the unit of analysis and conceptual targets as separate domains rather than a combined action target. Separating them would allow greater tracking of conceptual targets which are largely lacking in the literature. Despite these limitations, the conclusions of our study are consistent with previous reviews calling for improved reporting (Bunger et al., 2017; Leeman et al., 2015; Lokker et al., 2015; Powell et al., 2014; Wilson et al., 2017).

Conclusions

Implementation strategy reporting presents a serious challenge to the mental health literature. Scores for adherence to reporting recommendations for our sample of articles are 53.9%. We recommend that researchers include an implementation strategy description table based on a reporting guideline as a supplemental/additional file for their manuscripts. Implementation science is an emerging discipline. Ensuring uniform strategy reporting across studies will enhance advances yielded by meta-analyses and other reviews, will help develop testable theories, and will help organizations employ implementation strategies (Bunger et al., 2017; Lewis, Klasnja, et al., 2018; Michie et al., 2009; Simera et al., 2010). Intervening in these early years of the field could have long-lasting benefits.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of Abbreviations

CONSORT	Consolidated standards of reporting trials
STARI	Standards for Reporting Implementation Studies
TIDIER	Template for Intervention Description and Replication
WIDER	Workgroup for Intervention Development and Evaluation Research

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PRISMA 2009 Flow Diagram

Figure 1. PRISMA diagram for literature search

Legend: Figure shows how many articles were included/excluded at each step.

Figure 2. Percentages of implementation strategies reported for each domain

Figure shows the percentages of implementation strategies reported in total sample of studies for each domain.

Figure 3. Articles' adherence scores by year with prediction line

Figure shows the adherence scores of all included studies and predicted scores by year from 2007 to 2019.

Table 1.

Variables extracted from articles

Variables	Description
First author	The last name of the first author of the article
Publication year	The year the article was published
Title	Title of the article
Name of the journal	The name of the journal
Protocol paper	If the article was a protocol paper (yes/no)
Hybrid paper	If the article used a type I, type II or type III hybrid design
Study location(s)	Where the study was located
Implementation strategies	Based on recommendations by Proctor et al. (2013)
Name	Name of the implementation strategy
Definition	The definition of the strategy
Actor	The individual(s) who enacted the strategy
Action	The actions, processes or steps of the strategy
Target	Whom does the strategy target (unit of analysis) and conceptual target
Temporality	When is the strategy used
Dose	How much of the strategy is used
Outcome	Which implementation outcome(s) will be affected by each strategy
Justification	Empirical or theoretical rationale for selecting that strategy

Table 2.

List of extracted articles

Author	Year	Journal	Protocol paper	Hybrid paper
McHugo	2007	Psychiatr Serv	No	No
Mancini	2009	Psychiatr Serv	No	No
Cully	2010	Primary Care Companion J Clin Psychiatry	No	No
Lyon	2011	Adm Policy Ment Health	No	No
Ho	2011	Community Mental Health Journal	No	No
Williams	2011	JGIM	No	No
Jolley	2012	Behaviour Research and Therapy	No	No
Fortney	2012	Implementation Sci	No	No
Ruzek	2012	Implementation Sci	Yes	No
Cully	2012	Implementation Sci	Yes	Type II
Murray	2013	Child Abuse Neglect	No	No
Hamilton	2013	Health Services Research	No	Type II
Dorsey	2013	Implementation Sci	Yes	No
Schaumburg	2013	Journal of Psychosocial Nursing	No	No
Chung	2013	Psychiatr Serv	No	No
Stirman	2013	Psychiatr Serv	No	No
Cully	2014	BMC Health Services Research	Yes	Type II
McCabe	2014	Disaster Med Public Health Prep	No	No
Markstrom	2014	Int J Env Res Pub He	No	No
Geraedts	2014	Internet Interventions	No	No
Kirchner	2014	JGIM	No	Type III
Starin	2014	J Child Adolesc Psychology	No	No
Smith	2014	Palliative and Supportive Care	No	No
Waxmonsky	2014	Psychiatr Serv	No	No
Mignogna	2014	TBM	No	Type II
Huang	2014	Trials	Yes	No
Smith	2015	Adm Policy Ment Health	No	Type I
Hermens	2015	Eur Child Adolesc Psychiatry	No	No
Lindholm	2015	Evaluation and Program Planning	No	No
Naik	2015	Family Practice	No	Type I
Lewis	2015	Implementation Sci	Yes	Type II
Vis	2015	Internet Interventions	Yes	No
Kealey	2015	Psychiatr Serv	No	No
Granholt	2015	Schizophrenia Bulletin	Yes	Type I
Cohen	2016	Child Maltreatment	No	Type III
Johnson	2016	Contemporary Clinical Trials	Yes	Type I
Letourneau	2016	Current Women's Health Reviews	No	No
Durbin	2016	Early Intervention in Psychiatry	No	No
Marvin	2016	Early Intervention in Psychiatry	No	No

Author	Year	Journal	Protocol paper	Hybrid paper
Byatt	2016	General hospital psychiatry	No	No
Eiraldi	2016	Implementation Sci	Yes	Type II
Cucciare	2016	Implementation Sci	Yes	Type III
Norona	2016	Infant Mental Health Journal	No	No
Meffert	2016	Int J Ment Health Syst	No	Type I
Rockhill	2016	J Child Adolesc Psychopharmacol	No	No
Onu	2016	Trials	Yes	Type I
Munson	2016	Trials	Yes	Type I
Auslander	2017	American Journal of Orthopsychiatry	No	No
Aragonès	2017	BMC Health Services Research	Yes	No
Hadjistavropoulos	2017	BMC Psychiatry	No	No
Breithaupt	2017	Eating Behaviors	No	No
Stirman	2017	Implementation Sci	Yes	Type III
Egeland	2017	Int J Ment Health Syst	No	No
Volker	2017	Journal of Occupational Rehabilitation	No	No
Shresha	2017	Journal of Psychiatric Practice	No	Type I
Huang	2017	Prevention science	No	No
Granholm	2017	Schizophrenia Bulletin	Yes	Type I
Acri	2017	Trials	Yes	Type II
Patel	2018	Behavior Therapy	No	No
Monson	2018	Behaviour Research and Therapy	No	Type III
Amaya-Jackson	2018	BMC health services research	No	No
Wray	2018	BMC Health Services Research	Yes	No
Lewis	2018	BMC Research Notes	No	Type II
Clossey	2018	Community Mental Health Journal	No	No
Haynes	2018	Contemporary Clinical Trials	Yes	Type II
Accurso	2018	Eating Disorders	No	No
Lewis	2018	Implementation Sci	No	No
Johnson	2018	Implementation Sci	Yes	No
Nielsen	2018	JMIR Research Protocols	Yes	No
Barac	2018	Journal of Evidence Informed Social Work	No	No
Monroe-DeVita	2018	Psychiatr Serv	No	No
Garety	2018	Psychiatr Serv	No	No
Johnson	2018	Translational Behavioral Medicine	No	Type II
Murray	2018	Trials	Yes	Type II
Ssewamala	2018	Trials	Yes	Type II
Frantz	2019	BMJ Open	Yes	No
Egeland	2019	Implementation Sci	Yes	No
Marques	2019	J Consult Clin Psych	No	Type I
Ristkari	2019	Journal of Medical Internet Research	No	No
Bitter	2019	Scandinavian Journal of Caring Sciences	No	No

Author	Year	Journal	Protocol paper	Hybrid paper
Barwick	2019	Translational Behavioral Medicine	No	No

Table 3.

Summary statistics for extracted studies

N=81	
Year	
2013 or before	19.8%
After 2013	80.2%
Protocol	
Yes	30.9%
No/Not sure	69.1%
Hybrid	
Type I	12.3%
Type II	14.8%
Type III	6.2%
No/not mentioned	66.7%
Implementation strategy scores	
Mean	53.9
Median	51.9
Mode	55.6
Minimum	17.5
Maximum	100.0
SD	15.7