Writing an Evidence-based Article in Plastic Surgery: Translating Research into High-quality Care

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Summary: Evidence-based medicine (EBM) is a triad that integrates the physician's medical expertise and the patient's individual characteristics with the best available scientific evidence. As patients become more active in the clinical decision-making process, the application of evidence-based practice in the field of plastic surgery is more critical now than ever. As a field that is recognized by its innovation, plastic surgeons must understand the various aspects of EBM to enhance and keep the field at the top of medical discovery. Many initiatives have been implemented to guide researchers in the collection, analysis, and distribution of high-quality evidence. In particular, *Plastic and Reconstructive Surgery* introduced a new EBM series to provide plastic surgeons with the appropriate resources to generate and integrate high-quality evidence into their practices. As a part of this initiative, this article will assist researchers in producing an evidence-based article that is well-written, relevant, and impactful to incorporate evidence-based practice into the specialty. *(Plast Reconstr Surg Glob Open 2019;7:e2544; doi: 10.1097/GOX.0000000000002544; Published online 26 December 2019.)*

INTRODUCTION

The practice of evidence-based medicine (EBM) in Plastic Surgery has increased exponentially in the past 30 years.[1,2] *Plastic and Reconstructive Surgery (PRS)* launched an EBM initiative in 2010 with the goal of promoting evidence-based practice to enhance the quality of evidence that is available for surgeons and researchers within the field.[3] Before this, articles published in *PRS* predominately consisted of expert opinions, which are considered the lowest level of evidence (level V) according to the Oxford Center for Evidence-Based Medicine.[1,2,4] EBM is the integration of the physician's medical expertise, the patient's individual characteristics and values, and the best available data gathered from high-quality trials (Fig. 1).[5] Since the initiative began, several evidence-based articles have been published in *PRS*. EBM articles present a clinical scenario and guide the reader through the decision-making process to arrive at a treatment plan using the best available evidence, such as randomized controlled trials (RCTs), and systematic reviews. These articles summarize and analyze evidence in relation to current clinical practices to help authors write an evidence-based article in plastic surgery. This article will (1) guide readers on the literature review process to obtain the best available evidence and (2) provide recommendations to ensure high-quality, well-written EBM articles.

BEFORE WRITING

Research Topic

The first step in writing an EBM article is selecting a topic that is both interesting and relevant (Fig. 2). The topic should focus on a condition or problem that is encountered frequently in the clinical setting rather than one that is rare. Although evaluating rare conditions may be beneficial to a select few, conducting research on highly prevalent conditions is more beneficial because of its relevance to broader plastic surgery practices. Furthermore, researchers should select a topic with emerging information that could change current clinical practice when the evidence to support prevailing treatment is weak.

Searching the Literature

A thorough literature search is essential to deliver impactful evidence, as it confirms that there are no other articles that have already been written regarding one's
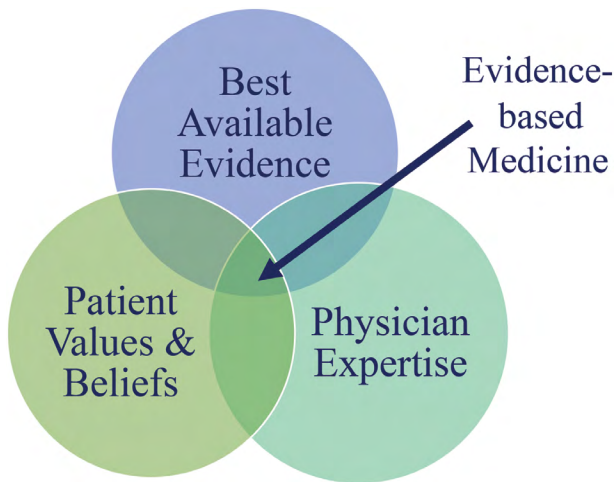
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Fig. 1. The core principles of evidence-based medicine.

topic of interest. Furthermore, an extensive literature searches of multiple databases, such as MEDLINE and the Cochrane Database of Systematic Reviews, enables the researcher to have a comprehensive collection of the current evidence regarding diagnoses, treatment protocols, and postoperative management. Authors should consult with a librarian and/or an information specialist to confirm that their literature search is exhaustive and accurate to ensure that high-quality papers are reviewed.

Understanding Level of Evidence

Understanding the levels of evidence is an essential aspect of the literature review process, particularly in the analysis of the quality of the studies. A study's level of evidence provides insight into its methodological quality, such as the overall study design and any inherent biases.[1] Levels of evidence are based on a hierarchical structure, with systematic reviews of RCTs as the highest level of evidence and expert opinions as the lowest.[4] The Oxford Center for Evidence-Based Medicine provides a guideline of this hierarchy and a detailed description of each level (Table 1). An ideal search of the literature should include studies of the highest levels of evidence, such as systematic reviews and

RCTs, to ensure minimal bias. However, researchers must be aware that, although a standardized method exists for assessing the quality of evidence, they should evaluate the methodology and results of each study critically themselves.[4] To assist in the evaluation of the evidence, researchers may use an alternative assessment tool called Grade of Recommendations, Assessment, Development, and Evaluations (GRADE) (Table 2). GRADE provides a systematic approach in evaluating the level of evidence based on the outcomes of the study rather than the methodology of the study.[6] Therefore, readers should use GRADE to augment the level assigned by the OCEBM to arrive at their own subjective conclusion of the literature. RCTs are considered one of the highest levels of evidence in the literature. However, plastic surgeons are faced with many challenges when conducting RCTs, such as randomization and blinding. In fact, <2% of articles published in *PRS* in 2013 were RCTs.[1,7] In other surgical fields, such as orthopedic surgery, this proportion is as high as 21%.[7] Randomization is a key component of RCTs, as it controls for unknown confounding factors and minimizes selection bias, which occurs when the study sample is not truly representative of the population.[8,9] On the other hand, blinding enables studies to minimize performance bias, which refers to the differences that occur because the researchers or participants have knowledge of their treatment allocation.[10] Specifically, there may be a difference in the care that is received by the participants, which will alter the outcomes of the study. For instance, researchers and physicians may treat the participants of one group differently than the other or patients may intentionally alter their answers to certain questionnaires based on their preference, which may inflate the effect of the intervention.[11] Although blinding is an ideal component in study design, factors such as patient preference and ethics may inhibit the ability to blind and randomize patients in surgical trials.[12]

Despite the limited number of RCTs, high-quality evidence still exists in the plastic surgery literature in the form of cohort studies and case-series. Specifically, prospective cohort studies track a sample of patients, over time, who has been exposed to different interventions to examine differences in outcomes of the cohort.[13]
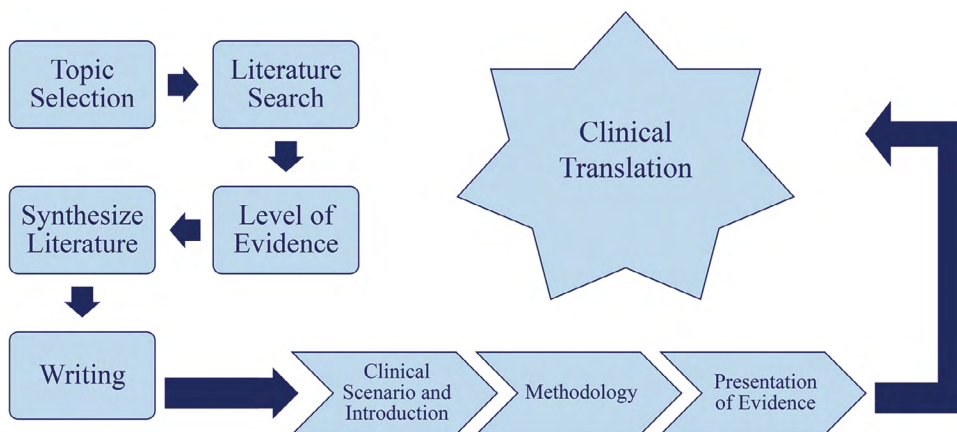

Fig. 2. Steps to writing an evidence-based medicine article.

Table 1. Oxford's Level of Evidence*

	Qualifying Studies
Level 1	
1a	Systematic review of RCTs
1b	Individual RCT (with >80% follow-up)
1c	All or none (met when all patients died before the Rx became available, but some now survive on it; or when some patients died before the Rx became available, but none now die on it)
Level 2	
2a	Systematic review of cohort studies
2b	Individual cohort study (including low quality RCT; eg, with <80% follow-up)
2c	Outcomes research; ecological studies
Level 3	
3a	Systematic review of case-control studies
3b	Individual case-control study
Level 4	Case-series (and poor-quality cohort and case-control studies that failed to clearly define comparison groups and/or failed to measure exposures and outcomes in the same objective way in both control and experimental groups and/or failed to control for confounders)
Level 5	Expert opinion without explicit critical appraisal, or based on physiology, bench research, or "first principles"

*From the Centre for Evidence-Based Medicine. Oxford Centre for Evidence-Based Medicine, Available at https://www.cebm.net/2009/06/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/. Accessed June 3, 2019.

Table 2. Grading of Recommendations, Assessment, Development, and Evaluations*

Certainty	What It Means
High	The authors have a lot of confidence that the true effect is similar to the estimated effect
Moderate	The authors believe that the true effect is probably close to the estimated effect
Low	The true effect might be marked differently from the estimated effect
Very Low	The true effect is probably marked differently from the estimated effect

*From the British Medical Journal Best Practices. What is GRADE? Available at https://bestpractice.bmj.com/info/us/toolkit/learn-ebm/what-is-grade/. Accessed July 10, 2019.

Furthermore, case series can track a group of patients with the same, known exposure over time to examine the outcomes. Although cohort and case studies are not considered level I evidence, they still have the ability to provide quality evidence depending on the study topic. Therefore, plastic surgeons should not discredit the quality of other study designs but apply various study designs tailored to specific study questions and the sample available to them.

Synthesizing the Literature

Similar to the protocol of a systematic review, such as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses, the authors should approach the literature search in an organized manner. The systematic approach should include factors such as strict inclusion/exclusion criteria and the collaboration of 2 or more researchers to review the literature. This will ensure that there are minimal errors in the interpretation and application of the conclusions to the synthesis of evidence. Furthermore, similar to traditional scientific articles, the study's design

should be stated explicitly in the EBM article, including the methodology of the literature review.

Given the evidence that is gathered from the literature search, one must perform a thorough review to identify limitations within the studies. Similar to the quantitative or qualitative data of a study, the individual articles gathered from a literature search are considered the "data" that will undergo analysis. There are several published guidelines providing researchers with proper assistance in analyzing studies for its use in EBM articles. For instance, Kelly and Cronin[14] provide in-depth instructions and questions to consider while reviewing primary and secondary literature. A thorough evaluation of the methods and results will assist in determining the strength of the literature, which will enable authors to determine the ability for recommendations to be made from the evidence.[14]

Furthermore, Paradis[10] identifies and discusses the biases that are inherent in surgical research, which provide researchers with strategies to evaluate the effects of biases within the literature. In particular, researchers should assess papers for publication and citation bias. Publication bias occurs when the results of a study influence the authors decision to publish. Ross et al[15] performed a cross-sectional analysis on systematic reviews to evaluate if publication bias was assessed in the reviews. Approximately 92% of systematic reviews did not specify or formally evaluate for publication bias. As evident, there is a strong indication for authors of EBM articles to analyze articles and gray literature independently for publication bias. Song et al[16] published an exhaustive program on preventing and detecting publication bias for the National Institute for Heal Research. This program serves to assist authors in their evaluation of primary literature for any biases that may affect secondary literature.[16] Furthermore, authors should evaluate the literature for citation bias, which occurs when a study does not report its results accurately.[10] For example, Frank et al[17] conducted a cross-sectional analysis and examined citation bias in studies that analyzed the accuracy of diagnostic imaging. The authors found that studies that reported high accuracy were cited more frequently than studies reporting low accuracy.[17] Although citation bias may not affect the results of the study itself, it can affect the validity of secondary literature, which can lead to misconceptions in clinical care.[18]

STEPS TO WRITING AN EBM ARTICLE

Abstract

Whereas the abstracts of traditional articles provide a summary of each section of the study (background, methodology, results, and discussion), EBM articles provide learning objectives in addition to the summary. The learning objectives outline the risks and benefits of various interventions, common risk factors, and any complications that may arise. An outline of the learning objectives provides readers with a quick synopsis of the article that is easily accessible, which can assist in determining the appropriateness of the article in the reader's search for evidence. For example, Kerrigan and Slezak wrote an

evidence-based article regarding reduction mammoplasty which aims to (1) accurately identify indications for breast imaging before reduction and (2) recognize factors associated higher rates of perioperative complications.[19] The abstract includes 9 objectives describing various surgical skills and focused the reader's attention on different decisions that surgeons will most likely have to make in reduction mammoplasty cases.

Clinical Scenario and Introduction

Authors may choose to introduce their article with a "clinical scenario," which is a presentation of a patient case that may raise questions in the clinical setting. The clinical scenario can be developed using the PICOS format, which outlines the population/problem (P), intervention tested (I), comparison group (C), outcome measures (O), and study design (S).[20] For example, Neumeister et al presents the case of a 26-year-old male with a zone II flexor tendon laceration and asks the readers to determine the best available evidence to formulate this particular patient's treatment plan.[21] By doing so, the author is priming the reader's mind to think about the evidence regarding the specific condition or problem that is presented in the patient case. In other words, this often encountered clinical scenario encourages the readers to solve the problem through critical analysis of the best available evidence in the literature.

Authors can begin the introduction by providing background information regarding the condition and including information such as the prevalence or incidence rates, along with the common comorbidities. For instance, Calandruccio and Thompson[22] discuss the evidence-based treatment decisions regarding carpal tunnel syndrome and elaborate on the common comorbidities, such as diabetes and obesity, because these are commonly seen in the clinical setting. By doing so, the authors provide the physician with the different patient factors that they may need to account for in the decision-making process to create an individualized treatment plan.

Presentation of Evidence

Researchers should consider the PICOS model, along with any limitations to the study design and biases in the results, when presenting the evidence from the literature (Table 3). Because limitations of a study design may affect the generalizability of the results, it is important that researchers make note of these in regard to the clinical

Table 3. Addressing PICOS in an Evidence-based Medicine Article

	Questions to Consider
Population/problem P	Who is the cohort of patients? What is the specific condition being observed?
Intervention I	What is the intervention in question?
Comparison C	What is the control or comparison group?
Outcomes O	How is the effectiveness of the interventions being measured?
Study design S	What is the study design?

translation of the findings. Furthermore, a discussion of the interventions that are being tested should examine any controversy that exists regarding those interventions. For instance, Neumeister et al[21] discuss the effects of suture material or strand configuration on postoperative outcomes of flexor tendon surgery. The authors provided evidence to support both sides of the argument, citing studies that have shown either suture material or strand configuration to have the most effect on the postoperative outcomes.[21] By doing so, the authors may inspire further research by emphasizing the gaps within current clinical practice. This not only promotes the continuation of medical education but provides readers with an opportunity to apply their own clinical experience to make well-informed decisions.

The researchers should present the findings as a synthesis of the evidence from multiple sources to provide an in-depth discussion on the perioperative care of the specific condition. For instance, Neumeister et al guides the reader through the decision-making process by providing a discussion of the preoperative, intraoperative, and postoperative care. Specifically, the authors start by presenting the evidence regarding the diagnostic assessment methods, such as physical tests and imaging, to deliver a proper diagnosis of flexor tendon laceration.[21] Then, the authors discuss the various surgical options for treatment, along with its implications and benefits.[21] Lastly, the authors provide readers with the rehabilitation protocol following repair, including suggestions for different cohorts of patients in terms of age.[21] Ultimately, the authors are able to synthesize all of this evidence to provide a recommendation to the readers regarding the clinical scenario that was introduced initially. By doing so, the authors are demonstrating the translation of this evidence into the clinical setting, for which the readers can turn into action.

References

Similar to traditional scientific articles, the reference section is an essential component because it provides readers with recent, scholarly articles that are relevant to the topic at hand. This section should contain articles with evidence-based recommendations, reviews, and landmark findings, which permits readers to conduct a deeper review in a particular subtopic. For instance, a hand surgeon can use the reference section of Neumeister et al to identify studies that provide a more in-depth discussion of a specific repair technique mentioned in the article.[19] Although the surgeon has the option to refer to the larger databases, the reference section of EBM articles will not only provide an appropriate launching point but it will also save the surgeon an abundance of time in conducting a literature search from the beginning.

PITFALLS

Research bias is apparent in all studies, regardless of the level of evidence. Thus, researchers should be cognizant of any inherent biases in the evidence that they use. Research bias presents as limitations to a study, affecting both the internal and external validity of the results. Internal validity is based on the accuracy of the study,

which measures the extent to which the evidence affects the cause-and-effect relationship of an intervention to its outcomes.[13] Factors that may affect the internal validity of a study include randomization and blinding. For example, Ramos et al performed a nonrandomized, double-blinded clinical trial to study the effects of photobiomodulation on wound healing after an abdominoplasty. Although there was a lack of randomization, the authors were able to minimize other biases affecting the internal validity of the study by blinding the patients and outcome assessors to the patient's treatment allocation.[23] On the other hand, external validity refers to the generalizability of the results to the population, which evaluates the ability to apply a study's conclusions outside of the context of that study.[13] Therefore, to present evidence that is generalizable, authors of EBM articles should aim to include results from studies with clear eligibility criteria and large sample size.[24] Additionally, Dobson recommends an evaluation of the patient demographic data to determine the applicability of the results to the population under assessment.[25] For instance, in the study examining distal radius fractures of elderly patients by Chung et al, the authors stated that the study's results were primarily applicable to the older population. Furthermore, the authors recommend that more research should be conducted examining the treatment options for distal radius fractures in the younger population to have generalizable results for this specific cohort of patients.[26] Thus, the authors of the EBM article should not present this evidence as applicable to all populations, such as children, but rather use it as supporting evidence for elderly patients only.

Authors should also be cognizant of bias in their own manuscript. For instance, the initial literature search may introduce confirmation bias, which is the tendency to interpret a study's results in favor of the author's opinion.[27] Thus, researchers must acknowledge both the supporting and opposing sides of a certain topic. For instance, Pickrell et al presented evidence in the management of atrophic mandible fractures regarding the use of thin or thick bone grafts.[28] The authors discuss the controversy regarding the timing, approach, and location of the bone grafts, providing the advantages and disadvantages for varying approaches to treatment.[28] Similar to Pickrell et al, researchers should mention evidence that may differ from their own findings. In fact, if the authors are able to discuss any opposing evidence and refute it with stronger evidence, then their conclusions will hold a much stronger value.[28]

CONCLUSIONS

An evidence-based article is an essential component for translating evidence to clinical practice to deliver high-quality, precise care. An EBM article is able to analyze recent evidence regarding the perioperative care of a specific condition and compare it with current clinical practices. Thus, understanding the process in writing an effective EBM article will provide plastic surgeons with quick, efficient access to the evidence that they need to meet the growing expectations of their patients. Furthermore, the presentation of high-quality evidence in the clinical context of an EBM article provides a primer for surgeons to implement that evidence into their clinical care. High-impact evidence will support plastic surgery's principles of innovation and influence the practice to deliver precise, evidence-based care.

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