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Christine Briccetti and Peter Rowe

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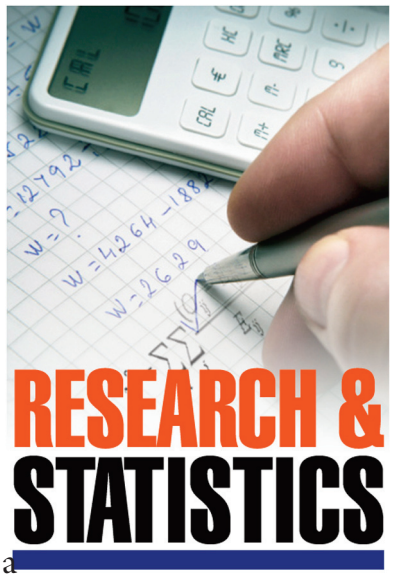

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Author Disclosure

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Searching for Answers: Strategies for Searching the Clinical Literature

Christine Briccetti, MD,* Peter Rowe, MD*

Case Study

You are evaluating a 5-day-old infant whose newborn screen was reported as positive for primary congenital hypothyroidism. While you await the results of his thyroid stimulating hormone (TSH) and thyroid assessment, the family asks you about the accuracy of the newborn screening. They want to know how likely it is that their baby has primary congenital hypothyroidism. How would you get the information needed to answer their questions?

Searching the Literature

MEDLINE is the National Library of Medicine's database of biomedical articles. PubMed (www.PubMed.org) is the free resource that is used most commonly to search the MEDLINE database. PubMed Clinical Queries (found under "PubMed Tools") is a feature that can be accessed from the PubMed home page. This tool filters out information that is not likely to be useful clinically. Although not suited for extensive literature searches, this procedure is an excellent method to search for useful clinical information in a few minutes.

The first step is to decide what question or information to enter into the search engine to obtain the most useful results. One approach is to phrase the query in the "PICO" format. (1) PICO is an acronym that was developed as a strategy to help break down questions into their most important subcomponents and translate them into terms that enable effective searches for related evidence-based information. The "P" in PICO stands for patient, population, or problem. (2) What are the characteristics of an individual patient that are important? Is the patient's sex, age, condition, or some other factor of particular importance? The "I" stands for intervention, which could include exposure, diagnostic test, prognostic factor, or treatment. (2) "C" represents comparison or the alternative to the intervention. (2) For example, when searching for information about a new therapy, the comparison might be the standard therapy or no therapy. A diagnostic test would be compared to the diagnostic test that is considered the gold standard. Finally, the "O" is the outcome. (2) Depending on the question, outcome could represent symptoms, adverse effects, mortality, or accuracy of diagnosis. Splitting a clinical question into these parts can aid in identifying the primary concepts to query with a search engine (Table 1). A clear, structured, and searchable question developed with this process for the search in the case study is: In newborns, how accurate is a positive newborn screen for congenital hypothyroidism compared with serum TSH in diagnosing congenital hypothyroidism?

Study Design

The next step is to determine what type of study best answers the clinical question (Table 2). The best type of study design to evaluate a diagnostic question is a cohort study, in which all patients receive both the test being evaluated and the diagnostic gold standard. (2) Evidence obtained from systematic reviews or meta-analyses of randomized, controlled

*Johns Hopkins University, Baltimore, MD.

Table 1. Example of the PICO Process to Identify a Research Question

P	Patient or Population	Newborns
I	Intervention or Indicator	Newborn screen for congenital hypothyroidism
C	Comparison	Serum TSH measurement
O	Outcome	Diagnosis of congenital hypothyroidism or the "accuracy of the test"

trials is considered the highest level of evidence.

Search Results

The next step is to find search terms based on the key concepts as identified in the PICO question. Depending on the variety and the usefulness of the articles obtained, the searchers may include some or all of the key concepts. Alternative spellings or terms may be needed to include a larger number of articles. Some of the search terms that may be appropriate for the question on the accuracy of the newborn screen for primary congenital hypothyroidism are listed in Table 3.

Combining search terms requires the use of Boolean operators. All similar terms are combined with the Boolean operator "OR" to indicate that they are synonymous. Key concepts are separated by the Boolean operator "AND" so that all concepts are included in the results. For example, a search of newborn screening AND congenital hypothyroidism under the category of diagnostic studies yields 20 studies and 16 review articles, including "Screening for congenital hypothyroidism: United States Preventive Services reaffirmation recommendation." (3) According to this article, 1 in every 25 newborns who has a positive screening result for hypothyroidism ultimately receives the diagnosis of congenital hypothyroidism.

Case Progression

You share the information you obtained from your literature search with the family. At this point, confirmatory test results have returned for your patient and you diagnose congenital hypothyroidism. You prescribe levothyroxine and schedule the family for an appointment with a pediatric endocrinologist. You explain to the parents that compliance with levothyroxine is crucial to prevent developmental delay. They ask you what the chances are that their baby will have intellectual disability, given optimum medical treatment.

Table 2. Choosing the Type of Research Study (2)

Type of Question	Best Type of Study
Diagnosis	Cohort study in which patients receive both the test being evaluated and the diagnostic gold standard
Therapy	Double-blind, randomized, controlled trial
Prognosis	Longitudinal cohort
Cause	Cohort studies (start with patients with and without the risk factor) Case-controlled studies (start with patients with and without the disease)

You design another PICO question to guide another literature search. Your "P" is children who have congenital hypothyroidism, "I" is treatment with levothyroxine and alternative is no treatment, and "O" is future cognitive ability. Because you are investigating the long-term outcomes of a patient who has a certain condition, you investigate cohort studies. In general, cohort studies follow patients who have a certain exposure (in this case, treated hypothyroidism) to a particular outcome (presence of intellectual impairment). Cohort designs are powerful for making an association between cause and effect. At the PubMed Clinical Queries page, you use the same key words of newborn screening AND congenital hypothyroidism but search under "prognosis." This time, in addition to getting the same review articles, you find 71 articles specifically related to prognosis. After limiting your results to papers published in the past 5 years in English, your total number of articles becomes 19. You find a clinical report from the American Academy of Pediatrics that states that if treated within 2 weeks of birth, children who have primary congenital hypothyroidism have similar intelligence, school performance, and neuropsychological testing results as their peers. (4)

Conclusion

Although most busy practitioners do not have the time for exhaustive literature searches for each clinical question they encounter, they can use the few steps outlined in this article to find answers to questions that matter most to them and their patients. Other articles in this series will give clinicians the skills to evaluate the quality and results of the articles they find.

Table 3. **Sample Search Terms**

	Key Concepts	Search Term
P	Newborns	Newborn or infant
I	Newborn screen for congenital hypothyroidism	Newborn screen for congenital hypothyroidism or congenital hypothyroidism diagnosis
C	Compared with TSH	
O	Accuracy of test	Accuracy or diagnosis

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