Evidence-Based Practice and Research: An Introduction
Learning Objectives

- Define Evidence-Based Practice & Evidence-Based Dentistry
- Apply the 5 A’s to the evidence-based research process
- Determine if a question is background or foreground
- Recognize and define PICO format
- Identify the appropriate domain for a given PICO
What is evidence-based practice (EBP) in the health sciences?

In the health sciences, evidence-based practice, which includes evidence-based dentistry or EBD, exists in many contexts, but it always looks at the intersection of research evidence, the health practitioner’s expertise, and the needs and values of the patient.
The ADA defines EBD as:

“an approach to oral healthcare that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient’s oral and medical condition and history, with the dentist’s clinical expertise and the patient’s treatment needs and preferences.”

EBD was first mentioned in the professional literature in a journal article in 1995.
The process of EBD follows a cycle known as The 5 A’s
The EBD Cycle: The 5 A’s

Seeing your patient leads into the cycle, as the patient prompts you to ask a question.
The EBD Cycle: The 5 A’s

After you ask the question, you acquire evidence to answer the question.
Next, you appraise the quality of the evidence.
Then, taking into account the evidence, your expertise, and the patient’s needs and preferences, you apply an answer to the question to patient care.
Next you assess how that went. Did it go as planned? Is the patient happy with the results? Often seeing the patient and assessing how it goes leads right back into the same cycle again with a new question.
These tutorials focus on three of the 5 A’s: Ask, Acquire, and Appraise - how to locate the best available research evidence for decision-making regarding your patient’s care.
Asking the Question
Determining what type of clinical question you have tells you where to go to find the best answer as efficiently as possible.

There are two main categories of questions that emerge from the patient encounter: Background and foreground.
Background questions are general, established knowledge questions that are informational in nature. They tend to ask who, what, where, when and why and may often be answered with textbooks.

Examples include:

“What causes TMJ?” and “What are the side-effects of Metformin?”
Foreground Questions

- Specific knowledge
- Applied to clinical decision making
- Patient-oriented
- Often answered with journal articles

Do patients with a partially edentulous maxilla report higher satisfaction with an implant retained RPD than patients with a conventional RPD?

In adult patients who smoke do implants with an acid-etched surface or hydroxyapatite coated implants have greater longevity?

Foreground questions ask for specific knowledge to be applied to a clinical decision and are usually about a particular patient or population. Answers to these questions are usually found in journal articles. Examples include:

“Do patients with a partially edentulous maxilla report higher satisfaction with an implant retained RPD than patients with a conventional RPD?” and

“In adult patients who smoke do implants with an acid-etched surface or hydroxyapatite coated implants have greater longevity?”
PICO: A Professional Standard

**P = Patient or population**

*How would you describe a group of patients similar to your own?*

*What is the condition or disease you are interested in?*

Once you’ve determined you have a foreground question, it is the professional standard to put foreground questions into the PICO format. What is the PICO format? It's a way of breaking down your clinical question into researchable parts.

P stands for patient or population. Consider how you would describe a group of patients similar to your own? What is the condition or disease you’re interested in?
PICO: A Professional Standard

**P** = Patient or population

*How would you describe a group of patients similar to your own?*
*What is the condition or disease you are interested in?*

**I** = Intervention

*What do you want to do to this patient?*
*Treat, diagnose or observe?*

I stands for Intervention. This is what you want to do to this patient. Are you treating, diagnosing, or observing?
PICO: A Professional Standard

P = Patient or population
   *How would you describe a group of patients similar to your own?*
   *What is the condition or disease you are interested in?*

I = Intervention
   *What do you want to do to this patient?*
   *Treat, diagnose or observe?*

C = Comparison
   *What is the main alternative (gold standard) to compare with the intervention?*
   *Your clinical question does not always need a direct comparison.*

C is comparison. It is usually the main alternative or what is traditionally done compared with the intervention. It is very important to note that your question does not always need a direct comparison. Sometimes you may be comparing to a placebo or doing something to doing nothing, in which case it may be left blank.
PICO: A Professional Standard

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**C** = Comparison

*What is the main alternative (gold standard) to compare with the intervention?*
*Your clinical question does not always need a direct comparison.*

**O** = Outcome

*What can you hope to improve, accomplish, measure, or affect?*
*What are the relevant outcomes? (comfort, cost, quality of life, longevity)*
*The outcome should be patient-oriented. In other words, it should be something the patient would care about and be described in a way a patient would understand.*

O stands for outcome. This should be patient oriented. What are you hoping to improve, accomplish, measure, or affect? How would you explain this to your patient?

Let’s try applying this asking the question process to a sample patient.
Your 58-year-old patient, John, presents at your office stating that chewing is difficult for him due to his damaged teeth. You find that teeth numbers 7 and 8 both are hopeless and will need to be extracted. You note in John’s patient history that he has Gastroesophageal Reflux Disease (GERD) and is a survivor of esophageal cancer. He indicates that he last had radiation treatment for cancer to his head and neck 5 years ago.

Seeing this patient brings a question to your mind......
For patients who have undergone head and neck irradiation does tooth extraction pose a risk of osteoradionecrosis?

You feel like this is probably a foreground question and are getting ready to put it into PICO format.

But wait! Is it an appropriate foreground question?
To help determine if the question is appropriate, consider the following two questions:

“Is this established knowledge?”, and “Is the question clinically relevant?”

If it is not established knowledge and it is clinically relevant, then it is an appropriate foreground question. Both criteria must be met in order to be an appropriate foreground question. If just one is not met, it is not an appropriate foreground question.
Let’s apply this to your proposed foreground question.

Is this established knowledge? As you gain experience and expertise, you may know right away if the answer is established knowledge. For now, consult a textbook. In this case, you go to Stat!Ref to search multiple textbooks simultaneously and quickly find in *Oral and Maxillofacial Pathology* that yes, the answer is well-established – tissue is more likely to become osteoradionecrosis after radiation.
For patients who have undergone head and neck irradiation does tooth extraction pose a risk of osteoradionecrosis?

Is this established knowledge?

Yes, according to current textbooks 14

Is this clinically relevant?

No, his teeth must be extracted.

Not an appropriate foreground question

Since this question represents established knowledge, you technically have enough information to determine if it is an appropriate foreground question, but to clarify, you may still ask, Is the question clinically relevant? In particular, would the answer to the question affect the treatment of the patient? His teeth need to be extracted whether or not he’s at greater risk of osteoradionecrosis, so no it does not.

Based on the answers to these questions, you determine that this is not an appropriate foreground question to ask for your patient.
Is there a way to prophylactically treat John to minimize his risk of osteoradionecrosis? Some sources recommend HBOT and others antibiotics. This gives you a clinical question that is not established knowledge and whose answer will directly impact the treatment plan for your patient. It is appropriate. Now you can proceed with breaking it down into a PICO.
Clinical Question: Does prophylaxis HBOT prior to extraction have less chance of developing Osteoradionecrosis compared to antibiotics in irradiated patients?
Clinical Question: Does prophylaxis HBOT prior to extraction have less chance of developing Osteoradionecrosis compared to antibiotics in irradiated patients?

P: Patients requiring tooth extraction who have undergone head and neck radiotherapy.

Our patients are receiving extractions and are irradiated.

When writing this into the PICO, spell it out more and state it more clearly. For instance, don’t assume that your audience will know by extraction you mean tooth extraction. Actually state tooth extraction.

What is the intervention we want to try?
Clinical Question: Does **prophylaxis HBOT** prior to **extraction** have less chance of developing Osteoradionecrosis compared to antibiotics in **irradiated patients**?

**P:** Patients requiring tooth extraction who have undergone head and neck radiotherapy.

**I:** Hyperbaric oxygenation

Prophylaxis HBOT. When putting this into the PICO, you don’t need to state prophylaxis. This is understood.

When using acronyms, consider what they stand for and spell them out. HBOT stands for hyperbaric oxygenation therapy. It’s assumed we’re using this therapeutically because of the P, so we don’t really need to say the therapy part. This leaves us with hyperbaric oxygenation. What are we comparing our intervention to?
Antibiotics. For the purposes of our question, it doesn’t matter which specific antibiotic is used, so we can leave this as is.

Next, we need to look to the O. What is the outcome we either want to happen or to avoid? And is it something we can explain to our patient?
Clinical Question: Does prophylaxis HBOT prior to extraction have less chance of developing osteoradionecrosis compared to antibiotics in irradiated patients?

P: Patients requiring tooth extraction who have undergone head and neck radiotherapy.

I: Hyperbaric oxygenation

C: Antibiotics

O: Prevention of osteoradionecrosis

In this case, we’re looking to avoid osteoradionecrosis. It’s important to state prevention in our Outcome, because it otherwise it could sound like we’re trying to cause this negative condition.
Finally, we need to write our PICO into a research question. This allows you to be able to state your PICO in a simple sentence in conversation.

In patients requiring a tooth extraction who have undergone head and neck radiotherapy does hyperbaric oxygenation or antibiotics lead to greater prevention of osteoradionecrosis?
Your PICO is then used to determine your question’s domain. The domain is the category that your foreground question falls into.

Why is the domain important? Domain helps focus your search by determining the type of information (study type) needed as well as in what order you should look for it. Study type will be looked at in more detail in the Appraising the Evidence tutorial. So what are the domains?
There are five types of question domains.

Therapy covers how to best treat the problem.

Notice in the example that we are looking at two different dental treatment options to prevent a negative outcome (development of caries).
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<td>Therapy</td>
<td>How to best treat the problem</td>
<td>In children with erupting molars do biannual fluoride varnish applications compared to biannual NaF applications better reduce caries?</td>
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<tr>
<td>Etiology/Harm</td>
<td>What causes the problem</td>
<td>For children with asthma does use of nitrous oxide for sedation pose a risk of asthmatic exacerbation?</td>
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Etiology slash Harm covers what causes the problem. Will this intervention possibly harm my patient? Or did this intervention lead to the development of a negative outcome?
Prognosis addresses what the problem will look like over time based on factors that are not actions performed or advised by the dental care team and anticipate likely complications of the problem. These factors are often an illness or condition that the patient has. For instance, incidence of caries in patients with or without Autism Spectrum Disorder. You, the dentist, do not give your patient Autism. This is what makes it a prognosis question rather than a therapy question.
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<td>Are pediatric patients with Autism Spectrum Disorder compared to pediatric patients without Autism Spectrum Disorder at an increased risk for caries?</td>
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<td>Determine the problem</td>
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Diagnosis looks at how best to determine whether and how severely the problem exists.
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<td>Economic Analysis</td>
<td>How much will this problem cost or what is the cost/benefit of treating the problem with this intervention</td>
<td>For edentulous patients do implant-supported dentures or conventional dentures cost more over time?</td>
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Economic analysis looks at how much the problem will cost or what is the cost and or benefit of treating the problem with this intervention. You may be tempted to feel that cost is known since a clinic charges a set price for a treatment. However, economic analysis looks at much more than just what the initial treatment costs in a particular clinic. It will look at what the treatment cost is over time. Does the treatment need to be fixed or retreated frequently? Does it have other economic impact on the patient’s life?
What is the domain for our PICO?

| P: Patients requiring tooth extraction who have undergone head and neck radiotherapy. |
| I: Hyperbaric oxygenation |
| C: Antibiotics |
| O: Prevention of osteoradionecrosis |

Research Question: In patients requiring a tooth extraction who have undergone head and neck radiotherapy does hyperbaric oxygenation or antibiotics lead to greater prevention of osteoradionecrosis?
Therapy

**P: Patients requiring tooth extraction who have undergone head and neck radiotherapy.**

**I: Hyperbaric oxygenation**

**C: Antibiotics**

**O: Prevention of osteoradionecrosis**

**Research Question:** In patients requiring a tooth extraction who have undergone head and neck radiotherapy does hyperbaric oxygenation or antibiotics lead to greater prevention of osteoradionecrosis?

It’s therapy. We are treating a problem with prevention by choosing prophylactic treatments.

Now that we have our PICO and know its domain, we’re ready acquire information by selecting search terms and searching.
References


References


