Searching literature to find the evidence: using the PICO/PIO/PEO formula.

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1. Planning a search strategy

What is Evidence Based Practice?
Evidence based practice is the process of systematically finding, appraising, and using research as the basis for clinical decision making. To find the research efficiently, the first step is to ask a well-designed clinical question based on the PICO, PIO or PEO formula.

PICO is a mnemonic used to remember the components that form a well-built clinical question and is used to find Quantitative data:

<table>
<thead>
<tr>
<th>P</th>
<th>Patient or Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Intervention (or Issue)</td>
</tr>
<tr>
<td>C</td>
<td>Comparison Intervention</td>
</tr>
<tr>
<td>O</td>
<td>Outcome</td>
</tr>
</tbody>
</table>

Sometimes your clinical question may not have all of these components. For example, there may not be a comparison intervention, in which case it is acceptable to use the formula PIO.

Example using PICO:
Does the use of hydrocolloid dressings (I) on elderly patients with pressure sores (P) increase comfort and healing rate (O) compared to hydrogel dressings (C)?

Break your question down into its key concepts using the PICO formula. It’s best to do this in a table.

Below each keyword make a list of alternative keywords or phrases that describe that concept. Think also about plurals, alternative spellings or US terms (e.g. color, colour) etc. See example below:

<table>
<thead>
<tr>
<th>Patient/Population</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly patients</td>
<td>Hydrocolloid</td>
<td>Hydrogel</td>
<td>Healing comfort</td>
</tr>
<tr>
<td>with pressure</td>
<td>dressing</td>
<td>dressing</td>
<td></td>
</tr>
<tr>
<td>sores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure sores</td>
<td></td>
<td></td>
<td>Pain</td>
</tr>
<tr>
<td>Sacral sores</td>
<td></td>
<td></td>
<td>Healing rate</td>
</tr>
<tr>
<td>Pressure ulcers</td>
<td></td>
<td></td>
<td>Comfort</td>
</tr>
</tbody>
</table>
PEO: This formula is usually used to find qualitative data e.g. quality of life, attitude, patient satisfaction and patient experience:

P - Patient or Population
E - Exposure
O - Outcome / emerging themes

Does exercise therapy improve the quality of life for stroke patients?

<table>
<thead>
<tr>
<th>Patient or population</th>
<th>Exposure</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>Exercise therapy</td>
<td>Quality of life</td>
</tr>
<tr>
<td>Stroke patients</td>
<td>Therapeutic exercise</td>
<td>Attitude to life</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td></td>
<td>Life attitudes</td>
</tr>
<tr>
<td>CVA</td>
<td></td>
<td>Patient satisfaction</td>
</tr>
</tbody>
</table>
2. Search techniques
In order to perform a search effectively you will need to make use of various search techniques.

a) Boolean Operators
When you search for information, it's very easy to get too many results or results that aren't really very relevant. You need to know how to combine search terms to get the best results.

When you type in more than one search term, you can link them with AND, OR or NOT – these are known as Boolean operators.

*Combining with ‘AND’*

As you can see, if you link your terms with AND, you will only retrieve items that mention both terms.

*When should you use ‘AND’*

- To combine different concepts, for example, *stroke patient AND exercise therapy AND quality of life.*
- To narrow your search and find fewer results.
**Combining with ‘OR’**

As you can see, if you link your search terms with OR, you will retrieve everything that mentions either term.

**When should you use ‘OR’**

- To combine synonyms, or terms with a similar meaning, for example, *stroke patient OR cerebrovascular accident OR CVA*.
- To broaden your search, and find more results.

**Combining with ‘NOT’**

If you link your terms with NOT, you will find results where one term is mentioned without the second term.

**When should you use ‘NOT’**

- To exclude terms which are irrelevant to your search - this is particularly useful when a word has more than one meaning. For example, if you wanted to find information on wound dressings but not honey dressings you could use *wound dressings NOT honey* to remove those results. However, it is not
always advisable to use NOT as the articles excluded may also contain information about your topic.

You can then plan your search, combining the keywords for each concept with ‘OR’ then ‘AND’ as shown below:

<table>
<thead>
<tr>
<th>Population/Problem</th>
<th>Intervention/ Exposure</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>Exercise therapy</td>
<td>Quality of life</td>
</tr>
<tr>
<td>OR</td>
<td>OR</td>
<td>OR</td>
</tr>
<tr>
<td>Stroke patients</td>
<td>Therapeutic exercise</td>
<td>Attitude to life</td>
</tr>
<tr>
<td>OR</td>
<td>OR</td>
<td>OR</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td>OR</td>
<td>Patient satisfaction</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVA</td>
<td>AND</td>
<td>AND</td>
</tr>
</tbody>
</table>

b) Truncation & Wildcards
Consider using advanced search techniques to save time and capture results that may otherwise be missed. Different databases use different symbols for truncation and wildcards – refer to the online ‘Help’ function in the database.

TRUNCATION
Truncation is a method of searching for more than word at a time, e.g. if you want to search for studies, study, student or students you can do this all at once using truncation. An example of a search for this is: stud*. The asterisk (*) tells the database to look for all words which begin with those letters, but that end in any letters.

WILDCARDS
A wildcard is a special character such as ? which is inserted into the middle of a word to replace a letter or a number of letters. This is particularly useful when searching for English and American spellings of words and means only one search has to be done instead of two, e.g. organi?ation will search for the English spelling organisation and the American spelling organization.
c) Field Searching
Databases usually search ‘All Text’, or similar, as the default search. To make the search more relevant you can change the field to **subject** or **abstract** – this will return fewer, more appropriate results. It is possible to search in other fields such as **Author, Title, Journal Title** etc. To change the field to search there will be a pull down menu next to the search box (see example from CINAHL database below):

![CINAHL database search example]

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d) Choosing the best database(s) to search
The most appropriate databases for your subject can be found on your subject LibGuide: [http://libguides.tees.ac.uk/](http://libguides.tees.ac.uk/). If your subject covers more than one subject area, consult the LibGuides for each subject. Rigorous research will require searching more than one database.

Look at the database description for the subject coverage and utilise any factsheets and online help to get the most from each database. There may even be a link to online help next to the database name. For example (you would click on ![online help icon]):

![CINAHL database description]
3. Refining your search results

Carry out your initial search as planned and if you aren’t happy with the number of results you have retrieved, try one or more of the following to alter those results.

Too few results?
You need to broaden your search:
- Check your spellings – you may have typed in a term incorrectly, or you may be using a UK term on a US-based database
- Use more general search terms
- Check you have used the correct Boolean operators (have you used ‘AND’ instead of ‘OR’)
- Use ‘OR’ to broaden the number of keywords used for each concept
- Use truncation
- Use fewer terms linked by ‘AND’
- Look at the results and see if you can find one with a relevant subject heading – then search under that heading
- Look at the fields that you are searching in – consider changing some of the less important terms to “All Text” or “Anywhere” searches
- As well as revising your search, see if you can use one of your relevant results as a launch pad to other research
- Are your limits too restrictive?
- Have you used the most relevant database(s)?

Too many results?
You need to limit and narrow your search. You can do this by publication date, age groups, country of publication or special interest category. You can also:
- Use more specific search terms
- Add further concepts to narrow the search e.g. in a particular part of the country or focus on one kind of product
- Make sure you have used the correct Boolean operators (have you used ‘OR’ instead of ‘AND’)
- Use phrase searching
- Look at the fields that you are searching in – consider changing some of the terms to “Article Title”, “Abstract” or to a controlled vocabulary field e.g. “Descriptors”
a) Using one good result as a launch pad
If you find an article that is particularly relevant for your subject you can often follow links within that record to find other useful articles.

b) Parallel Searching
Once you’ve searched the database and have found a useful result you can use a method called Parallel Searching to find more related articles:
- Click on the title of one of the results to view the full bibliographic details.
- Take a look at the subject headings that this article has been indexed under in the database. You may be able to click on these subject headings to search for that topic or add the new search term to your search manually.

4. Saving searches and creating alerts
Most databases allow you to save your searches so they can be rerun at a later date. They will also enable you to create alerts that will inform you of any new articles/research that meet your search criteria. You will need to create an account to use these functions. The online help available in each databases will explain how you can do this.