

# A Guide To Producing an Evidence-based Report

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## Evidence-based Practice

Producing and presenting an evidence-based report:

Defining the problem

Search for the evidence

Select the best evidence only

Present and write-up your findings under headings

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## Evidence-based Practice

Evidence-based practice is a way to accelerate useful knowledge from research into clinical health-care practice. For the practitioner, it is a process of lifelong, self-directed learning, in which providing health care creates the need for important information about diagnosis, prognosis, treatment and other clinical and health care issues, and in which we:

- convert these information needs into answerable questions;
- track down, with maximum efficiency, the best external evidence (relevant research) with which to answer them;

- critically appraise that evidence for its validity (closeness to truth) and usefulness (clinical applicability);
- apply the results of the appraisal in health care practice; and
- evaluate our performance.

Producing an evidence-based report will assist you in learning the skills to practice evidence-based care.

The following is the protocol that has been developed over several years' experience to follow the lecture series in clinical epidemiology at the Faculty of Dentistry, University of Toronto.

# Producing and Presenting an Evidence-based Report

## A. Defining and describing the problem

1. What is the problem? How common is it? Why is it important? Is the problem getting worse, or better?
  - Is the issue one of causation, diagnosis, benefits or harms of care, costs, coverage?
  - What is your perspective (patient, dentist, payers, society)
2. State the question(s) clearly (the problem may have several embedded questions)
3. Restate the questions in useful/searchable form

## B. Search for the evidence

1. Decide on the very best study design(s) that should be employed to answer your question(s) – this will help you define your search strategy
2. Identify methods to find relevant articles
  - Medline, Embase (will often give about 50% of the total literature)
  - literature cited in your Medline identified articles
  - Faculty librarians and experts in the area are another place to check but do not end there (see Appendix 1 for list of other sources);
  - to avoid publication bias you need to look for 'gray' literature (unpublished; no significant results)

## C. Select the best evidence only

Ultimately five to seven very good articles for each question would be great, but if you have to compromise, you may need more and have to include those of lower level design, or quality, or from populations that do not represent your patients.

1. Employ explicit and reproducible criteria for selecting the evidence. Track what studies were rejected at what stage and for what reason. You may:
  - Reject at the title stage - many articles can be rejected by reading the title; e.g., the term "root fillings" may apply both to endodontically treated teeth and to fillings for root caries so you can eliminate some just by reading the title;
  - Reject at the abstract stage - others can be rejected at the abstract stage using preset inclusion (e.g., human studies only) and exclusion criteria (e.g., all studies of therapy without a comparison group);

- Reject at the full-copy stage by using criteria for critically appraising articles since now you can be sure if the study was strong (i.e., reject non-systematic reviews or all expert opinion articles where you have several that are stronger);
- Reject at the critical appraisal stage (i.e., copied articles read carefully and scored on the appropriate checklist; the studies should be included in the evidence table if they scored above \_\_\_\_). The cut-off you use depends on how many studies you have; for the purpose of this report you want the top 5-7 articles. If you have to take weak studies to get 5-7 then note in your report that the evidence for this question is weak.

2. Abstract the evidence from the remaining papers (say, the top 5-7) onto abstraction sheets (one study per sheet) or with experience directly into the evidence table (note the headings for the abstraction sheets/evidence-tables will vary depending on the question you are addressing).

For intervention studies, the abstraction sheet (and evidence table) needs to address PICOs plus C = PICOCs. This is the acronym for Population, Intervention, Control/Comparator, Outcomes plus Critical Appraisal comments – (see Kazim et al. The best methods for managing precarious coronal lesions at:

[http://www.utoronto.ca/dentistry/newsresources/evidence\\_based/coronallesions.pdf](http://www.utoronto.ca/dentistry/newsresources/evidence_based/coronallesions.pdf)) for a somewhat similar example.) For studies of causation, you need headings on Population, Exposure, Non-exposure, Outcomes plus Critical Appraisal comments. To compare diagnostic accuracy, the evidence table would have columns to describe the 'test' and the 'gold standard' instead of Intervention and Control/Comparator. For studies on other types of health care questions (e.g., natural history, economic analysis), you need to develop headings for the abstraction sheets and evidence table. Consult the critical appraisal sheets to develop the headings that would be most appropriate.

3 Develop criteria for communicating the strength of the findings of articles/reports. For intervention studies you can use the CTFPHE quality of the evidence (I – III) and the classification of the final recommendations (A - E). For all other types of studies you will have to develop your own assessment criteria (e.g., good, fair, or poor), based on the study design, how well the investigators conducted the study, and how much of a difference they found.

D. Present and write-up your findings under headings

1. Definition and importance of the problem
2. Patient population(s) that were included in your reviews and to which the findings are meant to apply
3. Clinical problem(s) addressed and not addressed
4. Clinical flexibility (any circumstances which would void the findings or recommendations)
5. Questions addressed and type(s) of studies searched for
6. Review of evidence:
  - i. Report criteria used in C (e.g., search terms, canvas of experts, hand search of journals)
  - ii. Report number of (you can use a table):
    - abstracts found matching search terms
    - articles identified through alternate means
    - articles rejected at the title stage
    - articles rejected at the abstract stage
    - articles retrieved and copied for review
    - articles rejected at first reading
    - articles/reports scored
    - articles meeting scoring cut-offs (see following table for example)

***Review of evidence: Does periodontal disease affect cardiovascular health?***

<b>Review of Evidence</b>	<b>Number</b>
<b>Abstracts matching search terms</b>	<b>63</b>
<b>Articles identified through alternate means.</b>	<b>20</b>
<b>Articles rejected at title stage</b>	<b>31</b>
<b>Articles rejected at abstract stage</b>	<b>26</b>
<b>Articles retrieved and copied for review</b>	<b>26</b>
<b>Articles rejected at first reading</b>	<b>9</b>
<b>Articles scored</b>	<b>17</b>
<b>Articles meeting cutoffs</b>	<b>8</b>

**Source: Abdulle et al. Do oral conditions affect cardiovascular health? QP2 Assignment 2003**

- iii. Cite references of all articles included in review at the end of the report
  - iv. Cite numbers of copied articles rejected and reasons (See: Fernandez et al. Best treatment for apthous ulcers. for a fairly good a 'reason for rejection' table at: [http://www.utoronto.ca/dentistry/newsresources/evidence\\_based/evidencebasedlearning.html](http://www.utoronto.ca/dentistry/newsresources/evidence_based/evidencebasedlearning.html)).
7. Summarize evidence:
- i. It is mandatory to produce an evidence table for each of the questions - use the abstracting form (See Appendix 2 for example of a form for intervention studies) then transfer the information to the evidence table. You could refer to <http://www.york.ac.uk/inst/crd/results.pdf>. for very detailed examples of evidence tables for assessing population-based interventions. Kazim et al at: [http://www.utoronto.ca/dentistry/newsresources/evidence\\_based/coronallesions.pdf](http://www.utoronto.ca/dentistry/newsresources/evidence_based/coronallesions.pdf). provide a similar attempt to assess interventions to manage early coronal lesions.
  - ii. For presentation, you may have to reduce the number of columns and double the information in a column to make it fit on a slide; e.g., omit title and put location of study in the first column
  - iii. Again note that the column headings on the evidence table will vary according to the question you are trying to answer
  - iv. Present and write up the findings with reference to the evidence table. For our process, do not comment on the detail of each article unless there are three or fewer in your evidence table. The comments should address the overall finding(s) and the confidence (strength) of that finding (the general), then any variation in the findings (the specific). Thus, you should draw the reader's/audience's attention to any studies that are notable in one way or another, i.e., if the findings from one set of researchers, one age group, etc., differ from the rest.

Evidence table:

Usually list the strongest study first, the progressively weaker ones following. For all studies include detail of the PICO&C (or other headings as required). For outcomes, depending on the type of question you are addressing, provide the sensitivity specificity of the test results, or the RR and 95% CI of risks associated with causation; the prevented fraction, or NNT for intervention studies or the cost-effectiveness measure. Words like higher, better, etc., are not helpful to the reader – give specifics. Often the author, year, and country of study, are presented in a separate column. Again, if your question is one of causation, diagnostic accuracy or cost-benefits, you will have to use alternate column headings for the intervention and comparator columns.

### Evidence Table Template

(You must modify column headings 3 & 4 for studies other than 'intervention' studies)

<b>Author, date</b>	<b>Population (Age, sex, location representative of ?)</b>	<b>Intervention, or Test treatment (Number studied)</b>	<b>Control treatment (Number studied)</b>	<b>Outcome</b>	<b>Critical appraisal comments/ strength of study/ conclusions</b>
<b>Study 1</b>					
<b>Study 2</b>					
<b>Study 3</b>					
<b>Study 4</b>					
<b>Study 5</b>					

8. Where there is more than one option for care, above and beyond the current standard, select and report on the interventions that have highest evidence of efficacy/effectiveness/efficiency/diagnostic accuracy (Restate classification of recommendation)

- Describe intervention(s)
- Describe method of (ease of) use in clinical settings
- Describe ease of introduction, costs of implementation and ongoing operation
- Describe costs per patient or population/year, etc.

9. For diagnostic tests or interventions, compare outcomes and costs of these with the current standard of care. Ultimately you would like to place the test or intervention in a technology assessment table as below:

**Technology Assessment Table**

<b>Compared to the control the intervention/ diagnostic test costs</b>	<b>Compared to the control or current standard of care, the diagnostic test or intervention works</b>		
	<b>Better</b>	<b>The same</b>	<b>Worse</b>
<b>Less</b>			
<b>The same</b>			
<b>More</b>			

10. State your overall conclusions - your evidence-based recommendation(s) and the strength of the evidence.

11. Provide any comments and suggestions for further research



## Appendix 1: List of potential sources of articles

- Medline (state search terms).
- Recent journals known to publish articles in this area (your Medline search should identify some of them)
- References to articles contained in those found above
- Contact with authors of recent articles for information on other studies/ other investigators
- Search of conference abstracts for additional papers
- Government studies/reports
- NIDR/MRC for investigators working in the area
- AHCPR/RCDSO/CDA for guidelines issued
- Clinic Manuals/ professors/ other experts
- Internet affinity groups ('Does anyone know about a study that answers the question ...?')

## Appendix 2: Abstracting the evidence for an intervention study

Authors, (Title), Year of Publication

Population description: (Location, age, sex, representative of general or special population, disease status)

Intervention (Test treatment)

Control (Control treatment)

Outcome

Critical appraisal comments/score

Conclusion (Intervention is effective, design strength and classification of recommendation)

Appendix 3: Checklists to aid in critically appraising studies presenting evidence on health care

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Checklist to Assess Evidence of Prevalence and Incidence  
(Descriptive or Longitudinal Studies)

Citation: \_\_\_\_\_  
\_\_\_\_\_

1. Was the study ethical? \_\_\_\_\_
2. Was the study internally valid? \_\_\_\_\_

Sampling:

- Was the sampling frame complete, or for longitudinal studies, were all members of the cohort entered at the beginning? \_\_\_\_\_
- Did the sampling scheme allow a representative sample? \_\_\_\_\_

Participation:

- Was the response rate 80% or higher, or for longitudinal studies, was loss to follow-up low - less than 20%? \_\_\_\_\_
- Was completion rate on individual items of the assessment instrument high? \_\_\_\_\_

Measurement:

- Did the survey use valid measures of disease (case definition) and risks? \_\_\_\_\_
- Were the data gathered using the best-accepted techniques? (e.g., trained telephone interviewers or examiners, mail questionnaire) \_\_\_\_\_
- Were the data tested for accuracy and reliability? \_\_\_\_\_

3. Do the findings relate to your population/patients?
  - Are the age/sex distributions similar? \_\_\_\_\_
  - Is there evidence of no systematic differences in prevalence or trends in disease between this group and your patients? \_\_\_\_\_
  - Is there evidence of no systematic differences in important environmental, behavioural or health care access factors between this group and your patients? \_\_\_\_\_

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Checklist for Assessing Causation

Citation: \_\_\_\_\_  
\_\_\_\_\_

Is the etiological agent infectious? If “Yes”, use 6A) test. If “No”, use 6B) tests.

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1. Was the study ethical? \_\_\_\_\_
2. Was the strongest design used to assess causation or risk? \_\_\_\_\_
3. Were cases defined validly and reliably measured? \_\_\_\_\_
4. Were the risks validly and reliably measured? \_\_\_\_\_
5. For diseases with multi-factorial risks, were the risks assessed controlling for other factors and was the (computer) model’s ability to correctly classify cases and non-cases strong ? \_\_\_\_\_
6. Do the findings meet the tests for causation? (Use either A or B tests)
  - A) Koch’s test for infectious agents
    1. Was the organism present in every case? \_\_\_\_\_
    2. Was the organism isolated and grown in a pure culture? \_\_\_\_\_
    3. Was the organism able to produce a specific disease when inoculated in an animal model? \_\_\_\_\_
    4. Was the same organism recovered from the sick animal? \_\_\_\_\_
  - B) Tests for causation of non-infectious agents.
    1. Did the “cause” precede the effect? \_\_\_\_\_
    2. Was the estimate of risk beyond chance, and large? \_\_\_\_\_
    3. Was there a dose-response relationship? \_\_\_\_\_
    4. Was reversibility demonstrated? \_\_\_\_\_
    5. Is the “cause” consistently observed in different times, places? \_\_\_\_\_
    6. Is the “cause” biologically plausible? \_\_\_\_\_
    7. Is the “cause” specific to that disease? \_\_\_\_\_
    8. Is the “cause” analogous to another established disease/exposure? \_\_\_\_\_

Adapted from: Fletcher, Fletcher and Wagner. Clinical epidemiology – the essentials. 3<sup>rd</sup> ed. 1996, and Sackett et al. Evidence-based medicine: how to practice and teach EBM. 1997

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Checklist for Assessing a Diagnostic or Predictive Test

Citation:

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- a) Was the study ethical? \_\_\_\_\_
- b) Is the test clearly described (including the cut-off values)? \_\_\_\_\_
- c) Was the test evaluated against a valid gold standard? \_\_\_\_\_
- d) Were the test results and disease status determined independently? \_\_\_\_\_
- e) Was the test evaluated using patients with a range of severity of disease? \_\_\_\_\_
- f) Was the test evaluated among patients with diseases that might be confused with, or are closely related to, the disease of interest? \_\_\_\_\_
- g) Is the test's performance reported using sensitivity/specificity, likelihood ratios \_\_\_\_\_
- h) Is the effect of moving the cut-off reported, or is the ROC curve provided? \_\_\_\_\_
- i) Does this test give better results than the current or standard test? \_\_\_\_\_
- j) Is the test likely to be acceptable to patients? \_\_\_\_\_

Adapted from: Fletcher, Fletcher and Wagner. *Clinical epidemiology – the essentials*. 3<sup>rd</sup> ed. 1996, and Sackett et al. *Evidence-based medicine: how to practice and teach EBM*. 1997

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Checklist to Assess Evidence of Efficacy of Therapy or Prevention

Citation: \_\_\_\_\_  
\_\_\_\_\_

1. Was the study ethical? \_\_\_\_\_
2. Was a strong design used to assess efficacy? \_\_\_\_\_
3. Were outcomes (benefits and harms) validly and reliably measured? \_\_\_\_\_
4. Were interventions validly and reliably measured? \_\_\_\_\_
5. What were the results?
  - Was the treatment effect large enough to be clinically important? \_\_\_\_\_
  - Was the estimate of the treatment effect beyond chance and relatively precise? \_\_\_\_\_
  - If the findings were “no difference” was the power of the study 80% or better? \_\_\_\_\_
6. Are the results of the study valid?
  - Was the assignment of patients to treatments randomised? \_\_\_\_\_
  - Were all patients who entered the trial properly accounted for and attributed at its conclusion? e.g.,
    - i) Was loss to follow-up less than 20% and balanced between test and controls or, if not, the effects of those losses satisfactorily accounted for? \_\_\_\_\_
    - ii) Were patients analysed in the groups to which they were randomised? \_\_\_\_\_
  - Was the study of sufficient duration? \_\_\_\_\_
  - Were patients, health workers, and study personnel “blind” to treatment? \_\_\_\_\_
  - Were the groups similar at the start of the trial? \_\_\_\_\_
  - Aside from the experimental intervention, were the groups treated equally? \_\_\_\_\_
  - Was care received outside the study identified and controlled for? \_\_\_\_\_
7. Will the results help in caring for your patients?
  - Were all clinically important outcomes considered? \_\_\_\_\_
  - Are the likely benefits of treatment worth the potential harms and costs? \_\_\_\_\_

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Checklist for Economic Analysis

Citation: \_\_\_\_\_  
\_\_\_\_\_

What type of study was this?

- i) cost identification
- ii) cost effectiveness
- iii) cost-benefit
- iv) cost utility

1. Was the problem stated clearly and relevant? \_\_\_\_\_
2. Was the perspective of the study appropriate and stated clearly? \_\_\_\_\_
3. Were all relevant options compared? \_\_\_\_\_
  - Are they known to be effective? \_\_\_\_\_
  - Are they likely to be acceptable to clients, providers, funders? \_\_\_\_\_
  - Is there any variation in effect by sex, age, severity? \_\_\_\_\_
4. Were all the outcomes of the relevant options identified and compared? \_\_\_\_\_
5. Were all the costs of the relevant options identified and compared? \_\_\_\_\_
  - Were returns to scale identified and discussed? \_\_\_\_\_
6. Were the values of the outcomes and the costs compared for the same point in time? \_\_\_\_\_
7. Were the results tested for sensitivity of the assumptions, e.g., discount and effect size? \_\_\_\_\_

Adapted from: Fletcher, Fletcher and Wagner. Clinical epidemiology – the essentials. 3<sup>rd</sup> ed. 1996, and Sackett et al. Evidence-based medicine: how to practice and teach EBM. 1997

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**Checklist for a Review Article**

**Citation:** \_\_\_\_\_  
\_\_\_\_\_

1. Was the question stated clearly and relevant? \_\_\_\_\_
2. Were the methods stated clearly? \_\_\_\_\_
3. Was the search for studies comprehensive (Medline, etc., selection from bibliographies, contact with investigators)? \_\_\_\_\_
4. Were the inclusion/exclusion criteria for studies clearly stated and relevant (population, intervention, outcomes, study designs)? \_\_\_\_\_
5. Was the validity of the primary studies assessed (e.g., independent reviewers, scoring of articles)? \_\_\_\_\_
6. Was the assessment of the primary studies reproducible and free from bias? \_\_\_\_\_
7. Were results of primary studies combined appropriately using:
  - summary tables \_\_\_\_\_
  - meta - analysis (watch that patients, etc., are similar in the studies combined) \_\_\_\_\_
8. Was the homogeneity of the primary studies analysed? \_\_\_\_\_
9. Were the conclusions consistent with results and strength of the primary studies? \_\_\_\_\_

**Adapted from: Fletcher, Fletcher and Wagner. Clinical epidemiology – the essentials. 3<sup>rd</sup> ed. 1996, and Sackett et al. Evidence-based medicine: how to practice and teach EBM. 1997**



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Checklist for a Clinical Practice Guideline (CPG)

Citation: \_\_\_\_\_  
\_\_\_\_\_

1. Is it recent? What was the date of last revision? (--/--/--) \_\_\_\_\_
2. Are the authors or issuing body credible and likely to be free of bias? \_\_\_\_\_
3. Are the objectives of the CPG and targeted patient populations clearly stated? \_\_\_\_\_
4. Were all the relevant options for care considered? \_\_\_\_\_
5. Was the search for, and appraisal of, the evidence consistent with evidence-based methods? \_\_\_\_\_
6. Were the benefits, harms, and costs well-described for those relevant options? \_\_\_\_\_
7. Were the strength of the evidence and the level of recommendation(s) stated? \_\_\_\_\_
8. Were considerations of patient preferences stated/included in the CPG? \_\_\_\_\_
9. Were the expected benefits, harms, and costs of the derived CPG stated? \_\_\_\_\_
10. Was there a sufficiently wide stakeholder/expert review process? \_\_\_\_\_
11. Was the consistency or inconsistency of the CPG with other guidelines justified? \_\_\_\_\_
12. Were dissenting opinions stated and dealt with appropriately? \_\_\_\_\_
13. Were any important caveats stated? \_\_\_\_\_
14. Were the relevant references cited and linked to specific recommendations? \_\_\_\_\_

Adapted from: Fletcher, Fletcher and Wagner. Clinical epidemiology – the essentials. 3<sup>rd</sup> ed. 1996, and Sackett et al. Evidence-based medicine: how to practice and teach EBM. 1997

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**Checklist for Decision Analysis**

**Citation:** \_\_\_\_\_  
\_\_\_\_\_

1. Was the study ethical? \_\_\_\_\_
2. Was the problem stated clearly and relevant? \_\_\_\_\_
3. Were all relevant options compared? \_\_\_\_\_
  - Are they known to be effective? \_\_\_\_\_
  - Are they likely to be acceptable to clients, providers, funders? \_\_\_\_\_
4. Were all the outcomes of the relevant options identified and their probabilities accurately calculated? \_\_\_\_\_
5. Were the patient preferences (utilities) of the outcomes validly estimated? \_\_\_\_\_
6. Was the 'tree' consistent with real life and the 'fold-back' conducted well? \_\_\_\_\_
7. Were all the costs of the interventions and their outcomes identified? \_\_\_\_\_
8. Were the values of the outcomes and the costs compared for the same point in time? \_\_\_\_\_
9. Were the results tested for sensitivity of the assumptions \_\_\_\_\_

**Do the results apply to my patients given their incidence of disease, their likely utilities, the likely outcomes of the options, and the costs they face?**

**Adapted from: Sox HC et al. Medical Decision Making. Boston; Butterworth-Heinemann 1988**