How to critique a paper

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BTU teaching 22\textsuperscript{nd} February 2018

- Discussion rather than a teaching session
- Personal preference rather than a right way
Structure

- Why read papers?
- What do you want to get out of it?
- What questions do you need to ask?
Why read papers?

- To guide practice
- For research
- To have something to talk about with the boss
- To have something to say to the patients
  - Prognosis, revision rate etc
- For exams
- For interviews

What do we need to know?

- What question have they asked?
- What have they concluded?
- Can we believe it?
How I read a paper

- Quick read through
  - Is this interesting?
  - Is there anything obviously fishy about it?
  - Have they done anything weird?

- Systematic read through
  1. Study question (end of introduction)
  2. Methods and stats
  3. Results
  4. Conclusions

Questions to ask a paper

- What question are they asking?

- What is the study design?

- What population are they using?

- How are they analysing their results?

- What are they concluding?
What question are they asking?

- Do they actually ask a research question?
The purpose of this study was to determine the effects of patellar resurfacing on the clinical, radiographic, and functional outcomes of patients who underwent distal femoral resection for a femoral tumor and megaprosthesis reconstruction.
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PICO

- **Participants**
- **Intervention**
- **Comparator**
- **Outcome**
**PICO**

- **Participants**
- **Intervention**
- **Comparator**
- **Outcome**

The purpose of this study was to determine the effects of patellar resurfacing on the clinical, radiographic, and functional outcomes of patients who underwent distal femoral resection for a femoral tumor and megaprosthesis reconstruction.

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**What question are they asking?**

- Do they actually ask a research question?

- Is the question interesting?
  - Am I interested in the question?
  - Is *anybody* interested in the question?

- Do they have a hope of answering it?
Questions to ask a paper

- What question are they asking?
- What is the study design?
- What population are they using?
- How are they analysing their results?
- What are they concluding?

Study design

- What is the study design?
  - Is it appropriate for the question at hand?
<table>
<thead>
<tr>
<th>Type of question</th>
<th>Example question</th>
<th>Study type that will best answer the question*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment</strong></td>
<td>In [dogs with osteoarthritis], does [supplementation with glucosamine and chondroitin] compared to [no supplementation] [reduce lameness]?</td>
<td>Randomised controlled trial</td>
</tr>
<tr>
<td><strong>Prognosis and Incidence</strong></td>
<td>In [flat-coated retrievers with cutaneous lymphoma], does [being a male] compared with [being a female] affect [average life expectancy]?</td>
<td>Cohort study</td>
</tr>
<tr>
<td><strong>Aetiology and Risk</strong></td>
<td>In [ferrets], is [general anaesthesia by triple injectable agent] compared with [general anaesthesia by induction and inhalational agent] associated with [an increased risk of death]?</td>
<td>Cohort study, Case-control study, Cross- sectional study</td>
</tr>
<tr>
<td><strong>Diagnosis</strong></td>
<td>In [lactating dairy cattle] does [milk ELISA] compared with [serum ELISA] have [a better sensitivity and specificity for diagnosing fascioliasis]?</td>
<td>Diagnostic test validation study</td>
</tr>
<tr>
<td><strong>Prevalence</strong></td>
<td>In [adult racehorses] what is the [prevalence of laryngeal neuropathy] in winter?</td>
<td>Cross-sectional study</td>
</tr>
</tbody>
</table>

Bhandari JBJS 2002
When are RCTs unsuitable

- If they’re unfeasible
  - Rare conditions
  - Rare outcomes (revision, infection)
  - Heterogeneity

- If they’re unethical
  - Preoperative antibiotics
  - Fasciotomy in compartment syndrome

- If they’re not credible
  - Trauma RCTs?

Study design

- What is the study design?
  - Is it appropriate for the question at hand?

- Why have they chosen that type of study design?
  - It’s the best design to answer the question
  - It’s the only one they have the logistics to do

- Is that study design appropriate to answer the question?
Questions to ask a paper

- What question are they asking?
- What is the study design?
- What population are they using?
- How are they analysing their results?
- What are they concluding?
What population are they using?
- Will it answer the question?
- Does it have external validity?
- Are there enough people to answer the question?
  - Have they done a power calculation?

Power / sample size calculations
- *A Priori > Post hoc*

- Will you have reasonable confidence that you can spot a clinically significant difference with the numbers involved?

- Alpha and Beta?
  - $\alpha = p$ value = type I error = $<0.05$ (1 in 20)
    - how likely am I to get a false positive?
  - $\beta$ = power = type II error (actually 1-type II error) = 80% (1 in 5)
    - How likely am I to get a false negative?
Power / sample size calculations

- Ingredients:
  - Clinically significant difference
  - Acceptable alpha
  - Acceptable beta

- Clinically significant difference
  - Minimal detectable change (MDC)
  - Minimal clinically important difference (MCID)

How do they analyse their results?
How do they analyse their results?

- Statistical analysis appropriate for study design

<table>
<thead>
<tr>
<th>Randomised trials</th>
<th>Observational studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups are born the same through randomisation</td>
<td>Groups are different and must be adjusted for in the analysis</td>
</tr>
<tr>
<td>Measured and unmeasured confounding accounted for</td>
<td>Only measured confounding accounted for</td>
</tr>
<tr>
<td>Simple statistics</td>
<td>Regression</td>
</tr>
</tbody>
</table>
How do they analyse their results?

- Statistical analysis appropriate for study design
- All reasonable assumptions met or dealt with
- If non-randomised, all appropriate confounders adjusted for

- Multivariate linear regression models were used to assess the relationships between covariates that could potentially influence anterior knee pain, range of motion, extensor lag, and complication rate.
- Logistic regression models were used for multivariate analysis to include important and significant covariates (Table I).
- The significance level was set at 0.05
What do they conclude

- Is it in any way related to their study findings?
- Have they mentioned their limitations?
- Have they given you all the data?
  - If not, why not?

### TABLE II Demographic and Clinical Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Nonresurfacing (N = 60, 50%)</th>
<th>Resurfacing (N = 48, 44%)</th>
<th>Total (N = 108)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (SD, yr)</td>
<td>28.3 (17.4)</td>
<td>40.9 (18.8)</td>
<td>33.9 (19.3) (range, 12-75)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Sex (no.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>30 (50%)</td>
<td>24 (50%)</td>
<td>54 (50%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30 (50%)</td>
<td>24 (50%)</td>
<td>54 (50%)</td>
<td></td>
</tr>
<tr>
<td>Diagnosis (no.)</td>
<td></td>
<td></td>
<td></td>
<td>0.85*</td>
</tr>
<tr>
<td>Benign</td>
<td>5 (8%)</td>
<td>6 (13%)</td>
<td>11 (10%)</td>
<td></td>
</tr>
<tr>
<td>Primary malignant</td>
<td>47 (78%)</td>
<td>34 (71%)</td>
<td>81 (75%)</td>
<td></td>
</tr>
<tr>
<td>Metastasis or myeloma</td>
<td>8 (13%)</td>
<td>7 (15%)</td>
<td>15 (14%)</td>
<td></td>
</tr>
<tr>
<td>Post-radiation fracture</td>
<td>0</td>
<td>1 (2%)</td>
<td>1 (1%)</td>
<td></td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td></td>
<td></td>
<td></td>
<td>0.11</td>
</tr>
<tr>
<td>Mean (kg/m²)</td>
<td>26.4</td>
<td>27.9</td>
<td>27.0</td>
<td></td>
</tr>
<tr>
<td>&lt;25 kg/m² (no.)</td>
<td>26 (44%)</td>
<td>10 (29%)</td>
<td>36 (40%)</td>
<td></td>
</tr>
<tr>
<td>≥25 kg/m² (no.)</td>
<td>30 (54%)</td>
<td>24 (71%)</td>
<td>54 (60%)</td>
<td></td>
</tr>
<tr>
<td>Mean amount of femoral resection (%)</td>
<td>41%</td>
<td>37%</td>
<td>39%</td>
<td>0.33</td>
</tr>
<tr>
<td>Type of endoprosthesi (no.)</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>GMRS</td>
<td>44 (73%)</td>
<td>11 (23%)</td>
<td>55 (51%)</td>
<td></td>
</tr>
<tr>
<td>Femur</td>
<td>18 (27%)</td>
<td>37 (77%)</td>
<td>53 (49%)</td>
<td></td>
</tr>
<tr>
<td>Surgical approach (no.)</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Medial</td>
<td>39 (65%)</td>
<td>8 (17%)</td>
<td>47 (44%)</td>
<td></td>
</tr>
<tr>
<td>Lateral</td>
<td>21 (35%)</td>
<td>40 (83%)</td>
<td>61 (56%)</td>
<td></td>
</tr>
<tr>
<td>Mean followup time (SD, yr)</td>
<td>3.8 (3.0)</td>
<td>5.37 (4.8)</td>
<td>4.5 (3.97)</td>
<td>0.08</td>
</tr>
</tbody>
</table>

*For the difference in the number of patients who presented with metastasis or myeloma versus another diagnosis (benign, malignant primary, or post-radiation fracture), the body mass index is reported for thirty patients Fifty-six in the nonresurfacing group and thirty-four in the resurfacing group.
Questions