Teaching Osteopathics undergraduate students to be knowledgeable research consumers:

Why, When and How?

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First step

RESEARCH METHODOLOGY

CRITICAL READING AND INTERPRETATION OF OSTEOPATHIC AND MEDICAL SCIENTIFIC LITERATURE

Why?

- Use of scientific data in clinical practice to follow fast evolution and changes in knowledge domain
- Base clinical practice on scientific standards using scientific literature: long-term learning implication
- Clinical uncertainty contexts' recognition and management (Edmondson, 1995; Charlin, 2005; Luther & Crandall, 2011)
- Identify and support potential graduate-level academic research candidates

Why?

- Allow students to become readers and users of scientific data (Liccicardone, 2008; Audet & Leclère, 2001; Fryer, 2008) towards :
  - Acquainting with scientific data sources,
  - Doing an informed reading of scientific literature,
  - Knowing the difference between research types,
  - Assessing the validity of scientific articles,
  - Integrating scientific data in clinical reasoning and practice.

When?

- Critical reading and interpretation of scientific literature must prepare to assessment activities; so it must be presented to students early enough:
  - 4th year / 6-year program

How?

First activity: Becoming a knowledgeable research and statistics consumer

- **Prior to activity**
- **During activity**
- **End of activity**

How?
First activity: Prior to activity

- Team of 3 or 4 students
- Choice of one article per team among about 20 scientific preselected articles of many various designs
- Reading article and related theorical article/checklist concerning specific designs involved
- Preparation of a list of questions by each student

How?
First activity: During activity

- Research design descriptions:
  - Advantages
  - Limits
  - Examples
- Evidence hierarchy
- Internal validity
- External validity
- Presentation of various checklists

How?
First activity: During activity

- Research design descriptions
  - **Descriptive designs: generating hypothesis for further research**:
    - Case report
      - ex: LeBauer & al, 2008; Lancaster & Crow, 2006
    - Case series
    - Cross-sectional study
    - Qualitative research
      - ex: Pincus & al, 2004; Strutt & al, 2008

How?
First activity: During activity

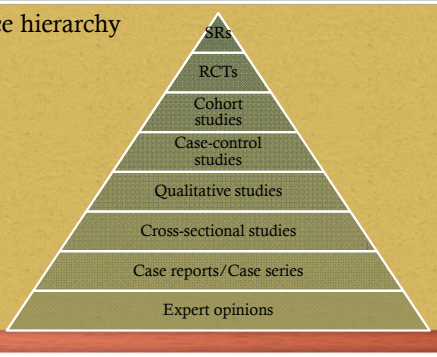
- Research design descriptions:
  - **Analytical observational studies: hypothesis validation:**
    - Case-control study
      - Based on presence of diseases
      - Odds Ratio (OR)
        - ex: King & al, 2003
    - Cohort study
      - To identify etiological risk factors (disease causations)
      - Based on exposure
      - Incidence, Relative Risk (RR)
        - ex: : Kotzampaltiris & al, 2009

How?
First activity: During activity

- Research design descriptions
  - **Analytical experimental studies: hypothesis validation:**
    - Intervention study
      - Control exposure, internal validity
      - Quasi-experimental (pre/post in CAM)
        - examples in osteopathy: Cuccia & al, 2009; Philippi & al, 2006
    - Systematic review
      - example in medecine: Juni & al, 2004
      - examples in osteopathy: Licciardone & al, 2005; Snelling, 2006

How?
First activity: During activity

- Evidence hierarchy



How?
First activity: During activity

- Internal validity (basic statistics, bias and potential confounders)
  - Meaning of the *P value* (p=0.05 or p=0.01)
  - Confidence intervals (95% or 99%) and precision
  - Kappa
  - Relative risks and odds ratio
  - Bias (selection, information)
  - Hill causality criteria
  - Potential confounders (gender, age, other variables)
- External validity

How?
First activity: During activity

- Presentation of various checklists
  - RCT:
    - Checklist from CONSORT statement : Moher & al, 2001
  - Cohort and case control studies:
    - Checklist for critical appraisal (in French) : Beaucage & Bonnier-Viger, 1996
    - STROBE : Rothwell & Bhatia, 2007
  - Qualitative studies:
    - Checklist for qualitative research in medecine (in French) : Côté & Turgeon, 2002
  - Case studies:
    - Checklist for a case study (design and presentation) : Tuchin & Bonello, 1999

RCT: CONSORT (1)

	Item number	Descriptor	Reported on page number
Title and abstract	1	How participants were allocated to interventions (eg, "random allocation", "randomised", or "randomly assigned").	
Introduction			
Background	2	Scientified background and explanation of rationale.	
Methods			
Participants	3	Eligibility criteria for participants and the settings and locations where the data were collected.	
Interventions	4	Precise details of the interventions intended for each group and how and when they were actually administered.	
Objectives	5	Specific objectives and hypotheses.	
Outcomes	6	Clearly defined primary and secondary outcome measures and, when applicable, any methods used to enhance the quality of measurements (eg, multiple observations, training of assessors, &c).	
Sample size	7	How sample size was determined and, when applicable, explanation of any interim analyses and stopping rules.	
Randomisation			
Sequence generation	8	Method used to generate the random allocation sequence, including details of any restriction (eg, blocking, stratification).	
Allocation concealment	9	Method used to implement the random allocation sequence (eg, numbered containers or central telephone), clarifying whether the sequence was concealed until interventions were assigned.	
Implementation	10	Who generated the allocation sequence, who enrolled participants, and who assigned participants to their groups.	
Blinding (masking)	11	Whether or not participants, those administering the interventions, and those assessing the outcomes were aware of group assignment. If not, how the success of masking was assessed.	
Statistical methods	12	Statistical methods used to compare groups for primary outcome(s); methods for additional analyses, such as subgroup analyses and adjusted analyses.	

RCT: CONSORT (2)

Results		
Participant flow	13	Flow of participants through each stage (a diagram is strongly recommended). Specifically, for each group, report the numbers of participants randomly assigned, receiving intended treatment, completing the study protocol, and analysed for the primary outcome. Describe protocol deviations from study as planned, together with reasons.
Recruitment	14	Dates defining the periods of recruitment and follow-up.
Baseline data	15	Baseline demographic and clinical characteristics of each group.
Numbers analysed	16	Number of participants (denominator) in each group included in each analysis and whether the analysis was by "intention to treat". State the results in absolute numbers when feasible (eg, 10/20, not 50%).
Outcomes and estimation	17	For each primary and secondary outcome, a summary of results for each group, and the estimated effect size and its precision (eg, 95% CI).
Ancillary analyses	18	Address multiplicity by reporting any other analyses performed, including subgroup analyses and adjusted analyses, indicating those prespecified and those exploratory.
Adverse events	19	All important adverse events or side-effects in each intervention group.
Discussion		
Interpretation	20	Interpretation of the results, taking into account study hypotheses, sources of potential bias or imprecision and the dangers associated with multiplicity of analyses and outcomes.
Generalisability	21	Generalisability (external validity) of the trial findings.
Overall evidence	22	General interpretation of the results in the context of current evidence.

Checklist of items to include when reporting a randomised trial

COHORT AND CASE CONTROL: STROBE (1)

STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up
		(b) For matched studies, give matching criteria and number of exposed and unexposed
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding
		(b) Describe any methods used to examine subgroups and interactions
		(c) Explain how missing data were addressed
		(d) If applicable, explain how loss to follow-up was addressed
		(e) Describe any sensitivity analyses

COHORT AND CASE CONTROL: STROBE (2)

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) Summarise follow-up time (eg, average and total amount)
Outcome data	15*	Report numbers of outcome events or summary measures over time
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(b) Report category boundaries when continuous variables were categorized
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

QUALITATIVE RESEARCH (1)

	Oui	±	Non
L'introduction			
1- La problématique est bien décrite et est en lien avec l'état actuel des connaissances.	-	-	-
2- La question de recherche est clairement énoncée et est pertinente pour une recherche qualitative (ex : processus de prise de décision, relation médecin-patient, expérience de soins).	-	-	-
Les méthodes			
3- Le contexte de l'étude et le rôle des chercheurs sont clairement décrits (ex : milieu dans lequel se déroule l'étude, biais).	-	-	-
4- La méthode est appropriée à la question de recherche (ex : phénoménologique, théorisation ancrée, ethnographique).	-	-	-
5- La sélection des participants est justifiée (ex : informateurs-clés, cas déviants).	-	-	-
6- Le processus de recueil des informations est clair et pertinent (ex : entrevue, groupe de discussion, saturation).	-	-	-
7- L'analyse des données est crédible (ex : triangulation, vérification auprès des participants).	-	-	-

QUALITATIVE RESEARCH (2)

Les résultats			
8- Les principaux résultats sont présentés de façon claire.	-	-	-
9- Les citations favorisent la compréhension des résultats.	-	-	-
La discussion			
10- Les interprétations des résultats sont vraisemblables et novatrices	-	-	-
11- Les limites de l'étude sont présentées (ex : transférabilité).	-	-	-
La conclusion			
12- La conclusion présente une synthèse de l'étude et des pistes de recherche sont proposées.	-	-	-

REVUE INTERNATIONALE FRANCOPHONE D'ÉDUCATION MÉDICALE

CASE STUDY (1)

CHECK LIST

Review your case presentation to assess whether each issue has been addressed. Some issues may not be easily identified, however, the more information that can be included, the stronger the paper becomes.

1. INTRODUCTION
   - DEFINITION •
   - MOST SUSCEPTIBLE •
   - DESCRIPTION •
   - AT RISK GROUP •
   - INCIDENCE •
   - MORBIDITY/MORTALITY •
   - AETIOLOGY •
   - NATURAL HISTORY •
2. CASE FEATURES
   - DESCRIPTIVE FEATURES •
   - CLINICAL HISTORY •
   - EXAMINATION FINDINGS •
   - OBJECTIVE TESTS •
   - SPECIFIC TESTS •

CASE STUDY (2)

3. TREATMENT
   - MANIPULATION:
   - TYPE(S) •
   - AREAS •
   - ANCILLARY THERAPY • YES • NO
   - EXERCISE • YES • NO
   - MEDICAL TREATMENT • YES • NO
   - CO-MANAGEMENT (IF ANY) • YES • NO
   - REFERRAL (WHO &/OR WHY) • YES • NO
   - PREVENTATIVE MEASURES • YES • NO
4. DISCUSSION
   - ALTERNATIVE TREATMENT •
   - POTENTIAL FOR MISDIAGNOSIS •
   - CHIROPRACTIC SIGNIFICANCE •
   - OTHER FEATURES .....
5. CONCLUSION
   - SUMMARY OF CASE (1-2 PARAGRAPHS)
6. REFERENCES
   - SEE JOURNAL FOR CONFORMITY TO CORRECT METHOD

How?
First activity: And, finally, discussion

- Short team presentation:
  - Quality of study
  - Opinion on study
- Discussion on clinical implications
- Time spent with students demonstrating interests and aptitudes to prompt future research carreer!

How?
First activity: Your turn!

- Want to try it?
  - Presentation of two articles
  - 20 minutes to read and critique methodology and result sections (teamwork)
  - Discussion on clinical implications
  - Comments and questions

Second step

ASSESSMENT OF ACQUIRED KNOWLEDGE

Why?

- Integration of evidences in the clinical reasoning process
- Similarities between research processes and clinical reasoning (Clark, 1997)
  - Observations – Hypothesis – Experimentation
- Development of clinical-thinking skills (Tonelli, 1998)
- Expressing questions in scientific terms

When?

- Integration of this process in the upper cycle of the program, before graduation
  - 4th, 5th and/or 6th/ 6-year program

How?

- Validity of single case:
  - « (…) case studies are the preferred strategy when « how » and « why » questions are being posed, when the investigator has little control over events, and the focus is on a contemporary phenomenon within some real-life context » (Yin, 1998)

How?

- Single cases can be of different nature:
  - A case presenting an interesting evolution,
  - A rare case : rare diagnosis, particular anatomy, reason for consultation rarely encountered in osteopathy,
  - A case for which treatments did not succeed even if they usually do for similar consultations,
  - A case presenting common signs and symptoms but turned out to be an unexpected, unusual or rare diagnosis,
  - A case in which an adapted therapeutic approach was necessary,
  - Or a case that simply encourages going further.

How?
Second activity: Your turn!

- Try to find a good case and, mostly, a good question!!
  - It's not that easy….

Bibliography

Audet, N. & Leclère, H. 2001. Les habiletés requises pour la lecture critique en médecine: un cadre de référence issu d'une recension des écrits. Pédagogie Médicale, 2(4), 206-212.
Beaucage C. & Bonnier Viger Y. 1996. Épidémiologie appliquée, Gaétan Morin Ed.
Charlin, B. 2005. Évaluer la dimension d'incertitude du raisonnement clinique. Revue internationale francophone d'éducation supérieure, 7(1), 5-6.
Clark, BR. 1997. The Modern Integration of research Activities with Teaching and Learning. The Journal of Higher Education, 68(3), 241-255.
Côté, L. & Turgeon, J. 2002. Comment lire de façon critique les articles de recherche qualitative en médecine. Pédagogie Médicale, 3, 81-90.
Cuccia AM, Caradonna C, Annunziata V, Caradonna D. 2010. Osteopathic manual therapy versus conventional conservative therapy in the treatment of temporomandibular disorders: A randomized controlled trial. Journal of Bodywork and Movement Therapy, 14(2), 179-84.
Edmondson, KM. 1995. Promoting self-directed learning in development or poorly defined subject areas: A problem-based course in molecular biology, genetics, and cancer. Annual Meeting of the American Educational Research Association, SanFrancisco.
Fryer, G. 2008. Teaching critical thinking in osteopathy - Integrating craft knowledge and evidence-informed approaches. International Journal of Osteopathic Medicine, 11, 56-61.

Bibliography

Juni P, Nartey L, Reichenbach S, Sterchi R, Dieppe PA, Egger M. 2004. Risk of cardiovascular events and rofecoxib: Cumulative meta-analysis. Lancet, 4(10), 364(9450), 2021-9.
King HH, Tettambel MA, Lockwood MD, Johnson KH, Arsenault DA, Quist R. 2003. Osteopathic manipulative treatment in prenatal care: A retrospective case control design study. J Am Osteopath Assoc., 103(12), 577-82.
Kotzampaltiris PV, Chou KJ, Wall SP, Crain EF. 2009. The cranial rhythmic impulse and excessive crying of infancy. J Altern Complement Med,15(4), 341-5.
Lancaster DG, Crow WT. 2006. Osteopathic manipulative treatment of a 26-year-old woman with bell's palsy. J Am Osteopath Assoc., 106(5), 285-9.
Lebauer, A., Bratlik, R. & Stowe, K. 2008. The effect of myofascial release (MFR) on an adult with idiopathic scoliosis. Journal of Bodywork and Movement Therapies, 12, 356–363.
Licciardone, JC. 2008. Educating osteopaths to be researchers : What role should research methods and statistics have in an undergraduate curriculum? International Journal of Osteopathic Medicine, 11, 62-68.

Bibliography

Licciardone, JC., Brimhall, AK & King, LN. 2005. Osteopathic manipulative treatment for low back pain: a systematic review and meta-analysis of randomized controlled trials. BMC Musculoskeletal Disorders, 2005, 6(43), 12 pages.
Luther, V. & Crandall, SJ. 2011. Ambiguity and Uncertainty: Neglected Elements of Medical Education Curricula? Academic Medicine, 86(7), 799-800.
Moher, D, Schulz, KF & Altman, DG. 2001. The CONSORT statement: revised recommendations for improving the quality of reports of parallel-group randomised trials. Lancet, 357, 1191-1194.
Pincus T, Vogel S, Breen A, Foster N. 2006. Underwood M. Persistent back pain--why do physical therapy clinicians continue treatment? A mixed methods study of chiropractors, osteopaths and physiotherapists. Eur J Pain, 10(1), 67-76.
Rothwell PM, Bhatia M. 2007. Reporting of observational studies. BMJ, 20, 335(7624),783-4.
Snelling NJ. 2006. Spinal manipulation in patients with disc herniation: A critical review of risk and benefit. International Journal of Osteopathic Medicine, 9, 77-84.
Strutt R, Shaw Q, Leach J. 2008. Patients' perceptions and satisfaction with treatment in a UK osteopathic training clinic. Man Ther, 13(5), 456-67.

Bibliography

Tonelli, MR. 1998. The Philosophical Limits of Evidence-based Medicine. Academic Medicine, 73(12), 1234-1240.
Tuchin, PJ. & Bonello, R. 1999. The design and presentation of a case study. ACO, 8(1), 5-9.
Yin, RK. 1998. Cité dans Lukoff et al. 1998, Case Study Research : Design and Methods. Berverly Hills, Calif : Sage : 1989.