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Mastering Critical Appraisal: Why Evidence-based Medicine Matters

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In the current climate of the COVID 19 pandemic and the tsunami of the research literature and evidence that is emerging on potential effective treatments, there has been a renewed focus on the importance of the practice of evidence-based medicine (EBM). EBM has been defined as the 'integration of best research evidence with clinical expertise and patient values'[1]. Essentially, it is to appropriately use the medical literature to find evidence that would help make correct clinical decisions and solve patient problems. It is crucial for physicians to not only remain up to date with the science, but also to be able to develop the skills to sift and sort meaningful evidence that should be applied into practice, from among the plethora of research publications.

While this might be expertise that should be actively acquired, most clinicians are familiar with the pyramid denoting the "hierarchy of evidence". This pyramid is based on the levels of evidence originally described in a report by the Canadian Task Force on the Periodic Health Examination in 1979,[2] and further expanded on by Sackett, et al.[3] All versions of these pyramids of hierarchy have placed expert opinions and weaker study designs such as case series at the bottom, followed by case–control and cohort studies in the middle, and the 'gold standard of research evidence', randomised controlled trials (RCTs), along with systematic reviews and meta-analyses derived thereof, at the summit.[2-4] The placement of systematic reviews at the top has been challenged, and further modifications to the pyramid, such as changing the straight lines separating study designs in the pyramid to wavy lines has been suggested in more contemporary modifications of this pyramid.[4] However, the key element remains that levels of evidence do indeed exist; this is particularly important when it comes to clinical decision-making, where the highest level of evidence should be given precedence over expert opinions and anecdotal evidences.

Thus, given the necessary shift to EBM within contemporary health-care practice, the necessity to remain updated on contemporary research cannot be overstated, in addition to acquiring skills required to critically appraise them. This is important, given the variable quality of research reports and inaccurate reporting of data. While guidelines have been developed for the accurate reporting of research evidence of various study designs by groups such as the EQUATOR (Enhancing the QUAlity and Transparency Of health Research) Network,[5] the onus is on each physician to independently appraise published research and apply them.

Essentially, EBM has been described as being based on five defined processes;[6] this 5-step process is more easily labelled as the "5 A's" and include the following: asking a focused question (Ask), finding the evidence (Access/acquire), critical appraisal (Appraisal), making a decision (Apply) and ultimately evaluating performance (Assess/ Audit).[7]

Perhaps the most important step in this process of evidence-based practice is critical appraisal, which is the systematic evaluation of clinical research papers (i.e. evidence) in order to establish the validity of the methodology, results, and their applicability to patient care.[7, 8] Various tools have been developed to aid the systematic appraisal of a research publication.[9, 10] Perhaps the most contemporary and relevant of them is the Critical Appraisal Skills Programme (CASP) that has developed tools for

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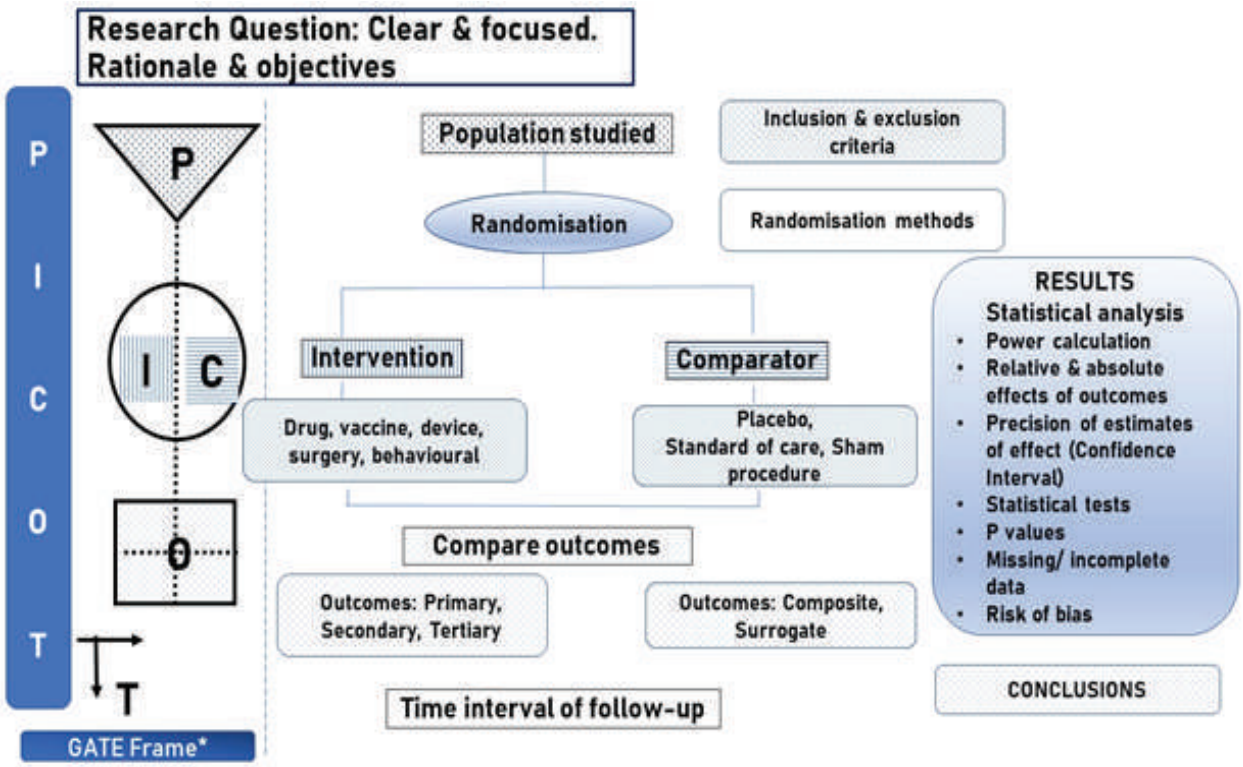

Figure 1: A practical approach to critical appraisal of a trial (GATE Frame* adapted from Jackson et al[12])

different study designs including randomized controlled trials.[10]

The first and essential step in critical appraisal is assessing the research question for clarity and focus. This is best done by the PICOT format, where the question should include the essential components identifying the PICOT acronym, namely Population, Intervention, Comparators, Outcomes and Time followed.[11] A pictorial depiction of this has been conceptualized for clarity in the form of the Graphic Appraisal Tool for Epidemiological studies (GATE) frame, which incorporates a triangle, circle, square, and arrow (Figure 1), labeled with the acronym PICOT.[12]

In a RCT, the validity of a study design and its methodology is further assessed by the methods of randomization and blinding, the reporting of missing data, and accounting for all patients who entered the study at its conclusion. The results, focusing on the effects of intervention and the soundness of statistical analysis (including elements such as statistical power, relative and absolute effects, precision of the estimate of its effects, p values etc.) must also be well-appraised. Finally, the applicability of the study's results to local practice is the last step of a good critical appraisal. A brief summary of these components, including the GATE frame for PICOT is depicted in Figure 1.

Critical appraisal of evidence in a manner that evaluates its trustworthiness, relevance and suitability to current practice is an essential skill for the contemporary physician, and more so for the contemporary cardiovascular physician. Indeed, given how robust and well-conducted cardiovascular trials are, as well as the wide range of trial designs adopted, they present a most appropriate starting point at which researchers and physicians can be first introduced to learning skills of critical appraisal.

In this edition of the Ibrahim Cardiac Medical Journal, we commence a new section titled "Journal

Scan", wherein we outline key findings of important RCT's of relevance in contemporary cardiology. We focus on the evidence of relevant publications that are both potentially practice-changing, as well as those with neutral or nonsignificant results of clinical importance. Critical appraisal is a skill that is built over time, incorporating a sound statistical knowledge with an understanding of the hierarchy of evidence and principles of research methodology. The need for this must be cultivated within physicians, such that EBM will guide clinical decision-making. This can be done by regular "journal clubs", reading original articles alongside critical reviews by leaders in the field, and eventually applying this learning into decision-making and patient care at the bedside. Ultimately, the practice of EBM will not only result in a sound clinician but also a resourceful researcher who will ask the most pertinent research questions and design studies that will specifically seek to answer them.

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