**EVIDENCE-BASED APPROACH IN ANATOMYAND ITS APPLICATIONS**

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**ABSTRACT**

Anatomy is not regarded as a field that is driven by research; rather, it is a basic medical science that describes things. One prominent category of clinical anatomy literature is prevalence studies, which look at clinically relevant anatomical differences and record their frequencies and/or connections with things like age, sex, side, laterality, and ancestry. The need to comprehend existing literature is discussed in this article. A unique concept termed evidence-based anatomy (EBA) is suggested to identify, assess, and synthesize the findings detailed in these studies. It entails using methods for evidence synthesis, such as meta analysis and systematic reviews, to offer weighted pooled data in the study of epidemiological anatomy. Large pooled sample sizes are more likely to yield pooled frequencies and associations that closely resemble real population statistics and are more reliable. Examined include the importance of EBA for current practice and prospective research, as well as its reach. It's also advised to use a checklist for a typical anatomical systematic review. The EBA technique would help maintain anatomy's status as a core basic science, ensure that anatomical variances are accurately understood, and ensure the safety of medical practice.

**INTRODUCTION:**

The subsequent subject of anatomy builds on the previously learnt information. A lack of structural knowledge may have an impact on future understandings of function and dysfunction, as well as knowledge and skills relevant to treatment methods.

The availability of contact hours for this essential subject in a hectic college curriculum has been steadily reducing, according to general consensus.1,2,3,4 Some people think that gross anatomy is a devalued discipline because it is no longer viewed as a research-driven field.5,6 Case reports of an aberration or a condition, prevalence studies using cadavers or radiological data, or descriptions of novel surgical techniques make up the majority of "anatomical" publications seen in clinical journals. The new idea of evidence-based anatomy is introduced in this article. It refers to the application of evidence-based techniques, namely evidence synthesis through systematic reviews (SR), to the study of anatomy.

**Anatomical Variations:**

The history of human anatomical variations is the history of anatomy, claim Sanudo et al. (2003)7. I would also add that improved methods for analyzing anatomical variances are essential to the field of anatomy's future. Vesalius is acknowledged as the second person after Galen to have established modern anatomy because of his publication De Humani Corporis Fabrica (Vesalius, 1542 [cited in Garrison and Hast, 2003])8, which contains multiple allusions to anatomical variations (Straus and Temkim, 1943; Hast and Garrison, 2000)8,9. In fact, determining the boundaries of normality is difficult; hence, it took decades for a compendium of human anatomical variations to be published.8,9  By indexing and publishing unusual anatomical variations in 2006, the editorial board of the journal Clinical Anatomy made progress10. The anatomy of organisms within each species varies, as is widely known, and this is true, among other things, of humans.11 So both "normal" variation between individuals and deviations or aberrations are included in the range of anatomical variances. An understanding of normal variations reflects the ability to comprehend the various practical realities of anatomy, hence anatomical variations must be seen as an essential part of anatomy training. Anatomical variances can be broadly categorized as belonging to one of three categories: morphometric (size and shape), consistency (presence, absence, or many), or spatial (proximal/distal or right/left bifurcation, artery supply, etc.). There are a few of such clinically significant anatomical variations. For instance, in addition to size differences, knee implant manufacturers design complete knee implants based on sex, ethnicity, and size discrepancies. The multiple anatomical factors associated with the structure of the median nerve and the causes of its compression serve as another illustration of the vulnerability to injury during surgical procedures.12,13,14,15 The anatomical heterogeneity of the cystic artery has been recognized as essential to laparoscopic cholecystectomy safety16.  Additionally, a rise in some medico-legal claims has been linked to inadequate anatomical understanding; many of these claims have been linked to "damage to underlying structures" and are considered a threat to patient safety17,18. Cahill and Leonard (1999) estimate that anatomical variance ignorance is responsible for 10% of clinical misconduct.19  Because not all "anatomical" difficulties are documented, and even when they are, they may not always be reported or published, many individuals believe that malpractice stemming from lack anatomical knowledge is underreported 20,21,22. Additionally, certain surgical "mistakes" in clinical practice don't lead to clinical consequences, as an iatrogenic injury to the radial artery during the implantation of an anterior plate for distal "Henry" approach radius fractures, but they do point to a lack of anatomical knowledge.

**EVIDENCE-BASED PRINCIPLES**

The phrase evidence-based principles (EBP) was initially used to refer to evidence-based medicine (EBM), which is defined as "the intentional, explicit, and sensible use of current best evidence in making decisions regarding the care of individual patients"23. Since its inception, the evidence-based movement has gained enormous popularity and been influential in almost every aspect of medicine as well as fields including allied health therapies, sociological and educational research, business management, and conservation biology.24

The concept of evidence-based medicine (EBM) is typically based on the stratification of five levels of evidence, known as the evidence hierarchy, ranging from meta-analyses (MA) with homogeneous results of high-quality Level I randomised controlled trials (RCT) to expert opinion—Level V, according to the Evidence-Based Medicine Working Group (1992). Quasi-randomization, prospective and retrospective comparison, case control, and case series studies are among the study types that fall between these two extremes. Systematic reviews (SR) of high-quality RCTs are at the top of the evidence hierarchy for interventional assessment in particular, while reviews of "lesser" study designs are seen as having lower levels of evidence.

To achieve a high standard of evidence synthesis, an SR identifies, assesses, and selects the evidence that is present in the literature and concentrates on a particular field of research. SRs have increasingly replaced conventional narrative reviews and expert opinions in order to provide factual summaries. The objective is to identify, evaluate, and synthesize the findings of the best research that is currently accessible on a certain topic using precise, standardized procedures. The data of qualifying studies are typically, but not always, combined using a statistical method known as pooling to obtain a pooled estimate that reflects the overall weighted average of the effect estimates from the included studies in relation to sample size.

**EVIDENCE-BASED ANATOMY**

Vesalius' work in the past extended beyond merely noting the variations he discovered or investigated. He also tried to use "subjective statistics" to ascertain how prevalent these mutations were in humans.

According to Straus and Temkin (1943) [cited in Sanudo et al. (2003)], Vesalius' book contains numerous expressions that can be translated as "always," "usually," "frequently," "more frequently," "most frequently," "sometimes," "not always," "rarely," "relatively rarely," "much more rarely," and "very rarely." Basic descriptive statistics were initially utilized in anatomical studies when certain doctors and anatomists published frequencies and subgroup rates of anatomical conditions at the end of the 18th century.25,26,27  Since then, the full range of descriptive and inferential statistics has been utilized consistently in anatomical papers. But the majority of those research—often referred to as cross-sectional studies or prevalence studies—are longitudinal studies, in which frequency data are acquired at a single moment in time. A study design like this is of importance for epidemiological research in anatomy because RCTs do not have a place in clinical anatomy, and case-control studies are unusual outside of investigations of the effects of surgical methods on patient outcomes.

Evidence-based anatomy may seem strange when combined with other words. However, measurements with descriptive statistics are used to define the "normal" range of morphometric variation, frequencies are used to evaluate inconsistent structures, and basic inferential statistics are used to search for associations with variables or differences between groups in morphometric and epidemiological studies of anatomical structures. Anatomy is a "dry" descriptive basic science, it is true. The three main categories of data derived from observational anatomical studies are means with standard deviations, prevalence, and odds ratios.

Such data collected from studies meeting preset inclusion criteria would be put to meta-analysis to obtain weighted pooled estimates. Results from a sizable, pooled sample are believed to be more trustworthy and accurately reflect population data. The results of anatomical prevalence investigations that have passed meta-analysis are therefore taken into account as the foundation of EBA.

**APPLICATIONS OF EVIDENCE BASED ANATOMY:**

It is possible to conduct systematic reviews and enhance observational research design using the evidence-based ideas of anatomy. As a matter of fact, when conducting our "anatomical" SRs, we were astounded by the sheer number of studies describing the prevalence of a condition without adequate reporting of: (a) baseline subject characteristics, such as age, sex, or side of the condition; (b) study characteristics, such as retrospective or prospective design; (c) the diagnostic tools, such as the radiographic views used to diagnose the condition; and/or (d) the outcomes of interest, such as side-based or

Undoubtedly, there is room for improvement, and editors should encourage researchers to submit this information whenever it is practical.

If researchers employed an EBA technique, they would carry out prospective investigations with planned and thoughtful designs.

However, I believe that efforts shouldn't be limited to identifying new variations or their predominance in a specific population. It's time for anatomical science to support the movement toward evidence-based medicine. Evidence syntheses like SRs and MA may be able to aid in making sense of what has been published. Today's literature contains a large number of prior studies, therefore it makes sense to employ meta-analytical techniques to more precisely estimate frequency in relation to anatomical factors.

The first published SRs and MA conducted in our Center for Evidence-Based Sports and Orthopedic Research (CEBSOR) yielded general and subgroup prevalence values for muscle agenesis, such as the Palmaris Longus, as well as bone structures like the os acromiale and the sesamoids in the hands.

Quantitative evidence that supported one etiological theory over another was also obtained through data analysis. For instance, it was determined that all of the illnesses we examined were genetically based rather than functionally. I'm not aware of any additional literature, at least not in a systematic way, that has explained or applied evidence-based notions to anatomy aside from the aforementioned works.

I must emphasize the significance of the pooled MA results because neither they nor the actual population prevalence of the condition under study reflect dogma. A pooled result is a best estimate; the conclusions drawn from the MA results are interpretations of the best available data at the time the SR was finished.

**THE POTENTIAL EVIDENCE-BASED ANATOMY:**

**Implications for practice:**

In this era of high-quality healthcare and the constant search of medical perfection, a complete grasp of anatomical structures and their variations is crucial for the effectiveness of our patients' therapies. The EBA approach will support teaching medical students and residents about clinically important variants, particularly in surgical specialties and diagnostic/interventional imaging. Numerous variations are also related to factors including age, sex, and particularly heritage. The ability to determine the prevalence of a mutation in different population groups will therefore be crucial for doctors everywhere. However, EBA will benefit any collection of anatomical variants since it will include descriptive data as well as overall and subgroup prevalence statistics.

**IMPLICATIONS FOR RESEARCH:**

It is crucial to emphasize that high-quality SRs depend on the availability of high-quality prevalence studies. Writing protocols before starting a prospective study reduces the likelihood of forgetting crucial data and their potential for subsequent analysis.

Thanks to MA, epidemiologists will have access to more precise prevalence data for comparison in subsequent research. The results from the general and subgroup pooling can confirm or deny previous frequencies or relationships, and it is expected that these findings will be frequently quoted in reference books. As an illustration, ratings in papers and books that are solely based on expert judgement are frequently used. Additionally, etiological theories like genetic, functional, or environmental ones may be evaluated with the aid of evidence synthesis.

**THE FUTURE SCOPE OF EVIDENCE BASED ANATOMY:**

The scope of the EBA may embrace almost all branches of anatomy, including the gross, microscopic, surface, surgical, and developmental. The use of EBA in osteo-archeology can be advantageous; as an illustration, the SR on the prevalence of os acromiale included skeletal research and provided a skeletal prevalence in addition to the radiographic and cadaveric results. There will also be additional opportunities for anatomists to engage in interdisciplinary research in a number of areas, such as pathology, kinesiology, biomechanics, functional anatomy, physical anthropology, biological anthropology, and biodistance. Additionally, increased chances for anatomists and physicians to work together are predicted.

In conclusion, I anticipate that EBA will both rekindle interest in the study of anatomy through the completion of systematic reviews and will establish a network for transdisciplinary research by first winning over anatomists and clinicians. I'm expecting an evidence-based review section will be established by anatomical journals soon to help foster the expansion of EBA. In terms of epidemiological anatomy research, it is safe to say that MA of prevalence studies will mark a considerable progress. Collaboration between anatomists/clinicians from varied backgrounds would be the ideal method to achieve this.

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