Review Article

Interdisciplinary Approach and Anesthesiology: Is There Any Role?

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Abstract

One of the most important features of interdisciplinary research is "team working"; leading to ***multidisciplinary, interdisciplinary,*** and ***transdisciplinary*** approaches in medical education. These approaches are applicable in research, education and service provision. There are a number of fields in anesthesiology that cope with the models that use disciplines; including novel anesthetic agents, pain clinics and pain management, pediatric anesthesia and a number of other distinct fields. Undoubtedly, other aspects of medical sciences are much involved in these areas.

Keywords: multidisciplinary; interdisciplinary; transdisciplinary; anesthesia

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Introduction

During the last years, the researchers have created new pathways to solve the unanswered questions; this new methodological pathway aims to answer the intricate questions which could not been answered separately or by one field of science; hence the term "Interdisciplinary research" has been coined for this evolving new field (1).

Though nowadays, we hear a lot about interdisciplinary research, the history goes a little far beyond this epoch; in fact it was Theodore Brown suggested first in 1980's that the "disciplinary approach of science could not solve all of our current scientific problems"; he could absorb a great grant and started work; meanwhile, the "interdisciplinary Santa Fe Institute in New Mexico" was founded about the same time (1, 2).

We know it today that if we want to solve our problems, there is a great must: the old "disciplinary approach" is not sufficient and we need the interdisciplinary approach as a need in all branches of science (3).

Definitions

One of the most important features of interdisciplinary research is "team working". If collaboration of researchers from different disciplines is omitted, the aim of collaborative researches will not be achieved. In this setting, multidisciplinary research is more suitable definition.

We encounter three expressions which are sometimes used instead of each other incorrectly. These expressions consisted of ***multidisciplinary***, ***interdisciplinary***, and ***transdisciplinary***; we continue the spectrum of these three fields the more comprehensive their contexts would be.

Multidisciplinary, interdisciplinary, and transdisciplinary research are three deferent phrases that are used by some investigators substitutable. In all three types of research there is some kind of communication between different disciplines, however the level and in somehow the objective of this coordination is completely different (4-7).

Interdisciplinary research

It needs to step outside the boundaries of disciplines and conducting an active debate for solving a problem as the main goal. In other words, disciplines begin to disappear and integration initiates; since the problem is not solved, just using a specific discipline. Many of interdisciplinary researches result in creating new applicable disciplines; this process involves using different viewpoints and perspectives from many wide range disciplines; the new "product" being a new methodology, could solve the "unsolved problems" (Figure 1). Interdisciplinary team-working could be often, but not always, applicable in the following areas (4-6).

- Research
- Education
- Service provision

Although it seems that the definition is clear, there are two other phrases, multidisciplinary and transdisciplinary that sometimes may lead to misunderstanding. In multidisciplinary research, contributors do not go beyond their disciplines. They add their opinion about the research subject without active or negotiation interaction with others. The objectives set separately by different disciplines (4-6) (Figure 2).

Transdisciplinary research

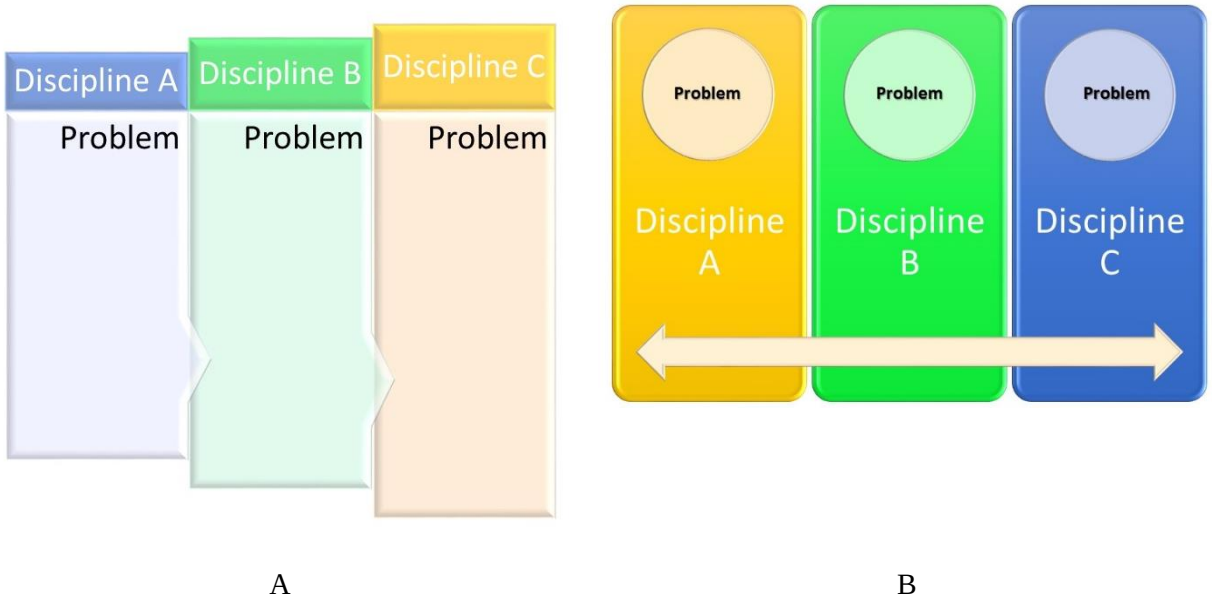
Projects have a holistic view to the problem. Different disciplines are dominated by the main research issue; in such a way that they are considered together as a whole (Figure 3) (4-6).

Convergence

After team working, the 2nd main feature of interdisciplinary research is convergence, which aims to focus different discipline towards a single problem; without the appropriate level of convergence, the interdisciplinary research will be deserved.

This approach has a historic background and well beyond the theory of Theodore Brown. Many great Persian and Greek scientists have used the realm of interdisciplinary methodology in their scientific fields; in old Persian science, the scientists were well known as "Hakim" which had the meaning of knowledge from a number of different disciplines (8-11).

The field of interdisciplinary research has greatly grown up now; currently, in scientific papers more than one-third of the research results are aimed at other disciplines (2).



A B

Figure 1. Interdisciplinary approach; A: sequential interdisciplinary approach; B: horizontal interdisciplinary approach

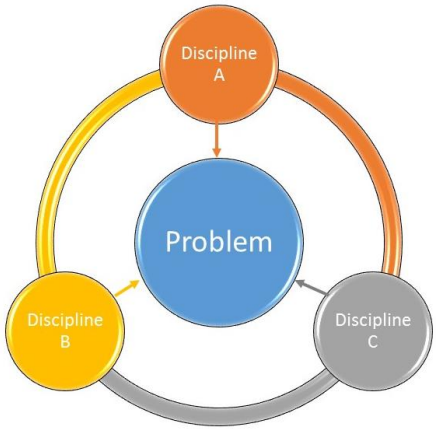


Figure 2. Multidisciplinary approach**.**

Interdisciplinary articles gain fewer citaations through 3 years after publication but after that their citations will improve. They have great impact on economy that renders more efficacies to it.

Impact on anesthesia

There are a number of fields in anesthesiology that cope with the models that use disciplines; including multidisciplinary, interdisciplinary, and transdisciplinary approaches. Though all these approaches do not have the same effect on anesthesia practice in its different branches; there are currently many aspects which well fit with these models.

Novel anesthetic agents

There are always concerns regarding the effects of anesthetics on different organs; including the apoptotic effects of volatile agents on brain, liver or other organs or the neuro-apoptotic effects of intravenous anesthetics on the developing brain especially in neonates and children (12-17); in addition to, the effects of local anesthetics and their potential neurotoxicity which mandates safer agents. These are yet unresolved and their solution will pass through emerging techniques which could yield to less potentially harmful anesthetics and related pharmaceuticals (18-25). In fact, safety in anesthesia is highly dependent on availability of safer drugs; no alternative except for choosing transdisciplinary approaches for risk reduction in this field; currently, studies on propofol, fentanyl, local anesthetics, and volatile agents have been published using these methods to improve current anesthetics; novel safer agents would emerge not necessarily with "animal proof of drug safety" based on these novel methods (26-31). Meanwhile, future education in anesthesia is undoubtedly dependent on such interdisciplinary aspects of anesthesia.

Pain clinics and pain management

Pain management, both acute and chronic pain, could be considered as one of the prototypic manifestations of both interdisciplinary clinical practice and interdisciplinary teaching in anesthesia. The outcome of the patients is often improved when an interdisciplinary bio-psycho-social approach is used. In such teams, anesthesiologists, psychiatrists, neurosurgeons, neurologists, physiatrists, orthopedic surgeons, other surgeons, palliative care specialists, clinical pharmacists, and podiatrists as well as the relevant paramedical professionals are all involved with defined roles for each of them (32-40). Meanwhile, footprints of cellular and molecular aspects of medicine could be well tracked in pain management; including, but not limited to immunology, molecular medicine and molecular biology; in addition, new findings show the application of emerging branches like microfluidics, lab-on-a-chip, biologic Micro Electromechanical systems (bioMEMS) and biologic nano electromechanical systems (bioNEMS) in pain management (31, 41-44). These aspects are either among the modern trend of education in anesthesia or are emerging fields that should be seriously considered in education of anesthesia in the near future.

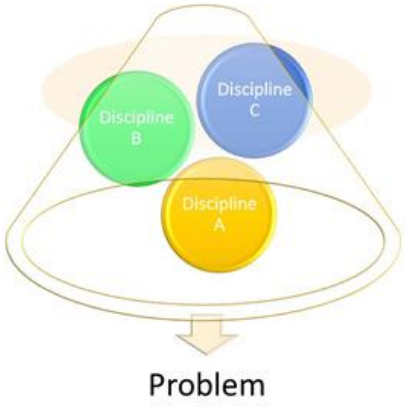


Figure 3. Transdisciplinary approach; Groups A, B and C have a holistic approach to the problem**.**

Pediatric anesthesia

During the recent years, there have been concerns regarding the possible role of anesthetic agents in neonatal and pediatric patient groups; however, there is still no proof because all the available studies of anesthetic agents on the neurodevelopmental aspects of life are related to animal studies and still no human study has proved any role for anesthetics in neurodevelopmental aspects of growth and development. Meanwhile, interdisciplinary studies could help find the facts, whether the neurodevelopmental aspects of growth and development in human being are directly affected by the anesthetics or not. Techniques like microfluidics and are bioMEMS could be of great help (21, 22, 25, 44-50).

Conclusion

Teamworking is part of medicine practice nowadays; with their integrative approaches as a method for increasing the efficiency of care and education. Other aspects of medical sciences are much involved in areas like pain management, novel pharmaceuticals, pediatric anesthesia and so on.

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Conflicts of Interest

None

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