IMPORTANCE OF UNDERGRADUATE RESEARCH IN MEDICAL AND DENTAL CURRICULUM

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ABSTRACT

INTRODUCTION

The quality of medical education has attracted considerable interest during the last few years. This interest is especially concerned with the question of how education can be made more relevant to the needs of today’s society. Emerging changes in today’s society such as rapid advances in technology, changes in demographics, environmental factors and life style may require a revision in the present system of education in such a way that students of health profession are trained to deal with problems in the future, preparing themselves to become active, independent learners and problem-solvers, rather than more or less passive recipients of information. The recent trend in medical and dental education is introduction of undergraduate research in the medical and dental curriculum. The present article reviews and describes the importance of undergraduate research to teach students how to conduct research and to develop necessary skills that can be applied outside the academic environment, to produce competent doctors and enhance patient outcomes.

KEYWORDS

Curriculum, Medical education, Undergraduate research

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https://doi.org/10.3126/jucms.v12i01.65660

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Over the last two decades there has been a transition in higher education creating powerful educational environments that improve learning. The link between development of strong research skills and the provision of medical care is inextricable. Research makes students better scientists, a core part of being a physician, and better prepares them to lead clinical practice. That’s why the research experience is stressed during undergraduate medical and dental education program. Several studies have shown that incorporation of research in undergraduate medical and dental curriculum enhances the self-directed learning and better understanding of the medical subjects. Participation in research will enhance attributes of scientific thinking, team working, leadership, communication, management skills, self-confidence, and continued advancement of knowledge. Therefore, undergraduate medical and dental curriculum must be revised to incorporate research as a fundamental component.  

Undergraduate research is a scholarly or creative investigation or inquiry conducted by an undergraduate student that contributes to the systematic production of new knowledge, an original intellectual or creative contribution to the discipline. It is a meaningful activity undertaken with the guidance of a faculty member or other research mentor(s) and is used to enrich the College academic curriculum and student experience. The research approach and preparation will differ depending on the disciplinary field and the specific research area. Thus Undergraduate research is defined as a scholarly effort, generally beyond the classroom, aimed at developing a student's skills in inquiry through opportunities to contribute to and/or pursue original intellectual or creative work.  

Students may work independently or in small teams and are mentored by a faculty member. Working with a faculty mentor enables students to share professional researcher’s work, learning how to formulate significant questions, developing investigative procedures, gathering and examining evidence, evaluating results, and sharing conclusions with the scientific community. Research with a faculty mentor establishes a meaningful relationship with faculty members and professional researchers, and offers a powerful learning opportunity that goes beyond the traditional classroom experience, and can impact the future career choices of undergraduate students. Students and faculty share the excitement of discovering something new. Students gain first-hand experience of real world research. Research balances student’s academic life with their personal life. The results of undergraduate research can be published in research journals. Research publications will be an excellent addition to students’ resume.  

The biggest challenge for students is usually figuring out what kind of research they’re interested in. The faculty mentors can help students choose a topic for research in a level appropriate for undergraduate students. The topics for research can be in the fields of medicine, public health, and allied health sciences. The research should lead to some contributions in generating effective interventions for preventions, diagnosis, treatment, or rehabilitation of those disease conditions. The research proposals must obtain the ethical clearance from institutional ethical committee, to strengthen the ethics in conduct of research.  

Table 1. Types of research  

<table>
<thead>
<tr>
<th>Discovery research</th>
<th>Development research</th>
<th>Delivery research or implementation research</th>
<th>Descriptive research</th>
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<td>Finding novel interventions (basic research) and validation in in vivo models</td>
<td>Developing interventions for screening, diagnosis, prevention, treatment of diseases/conditions or make existing interventions simpler, safer, more efficacious, or more affordable</td>
<td>Learning how to overcome barriers in delivering effective interventions to the people who need them</td>
<td>Understanding the disease or condition including its burden, risk factors and determinants and pathogenesis mechanism</td>
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Table 2. Some of the high priority research areas  

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<th>Communicable diseases</th>
<th>Non-communicable diseases</th>
<th>Reproductive, maternal and child health, nutrition</th>
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<td>Antimicrobial resistance, vector-borne diseases, tuberculosis, sexually transmitted infections, respiratory infections, urinary tract infections, Gastrointestinal infections including hepatitis, sepsis, meningitis, encephalitis, one-health approach for infections of epidemic or pandemic potential, etc.</td>
<td>Cardiovascular disease, cancer, diabetes, chronic respiratory diseases, chronic neurological diseases, chronic renal diseases, common mental health disorders, chronic gastrointestinal/liver diseases, trauma and burns, oral health problems, NCD risk factors (diet, activity, alcohol, tobacco etc.), blood disorders (thalassemia, sickle cell disease, clotting disorders etc.), climate change &amp; its impact on health, eye diseases, ENT diseases, ageing and elderly death, genetic diseases.</td>
<td>Preconception care, antenatal care, intra and peripartum care, postnatal care, preterm birth /low birth weight, neonatal sepsis, early child development, childhood malnutrition, breast feeding and complementary feeding, anemia in women and children, common childhood diseases, polycystic ovary syndrome and other reproductive health problems, adolescent health, contraception and infertility.</td>
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Table 3. Benefits of undergraduate research  

- Beneficial for academic success and professional career  
- Improves problem solving skills  
- Helps to think independently  
- Improves critical thinking skills  
- Improves the ability to deliver presentation in seminars  
- Helps to understand the relation between research and clinical practice  
- Helps in new knowledge acquisition  
- Strengthens self-confidence  
- Helps to apply theoretical knowledge into clinical practice  
- Motivates to continue post-graduate program  
- Improves internet research skills  
- Improves communication skills  
- Improves self-directed learning  
- Provides experience in laboratory studies and experiments  
- Improves the ability to search for literature  
- Improves the relationship between students and faculty
Undergraduate research experiences can vary from one student to another and from one discipline to another. Undergraduate research experiences help students understand a particular topic or phenomenon in a field while simultaneously strengthening their comprehension of research and research methods.\textsuperscript{15-17} Research with a faculty mentor offers a powerful learning opportunity that goes beyond the class room experience. Students share in professional researcher’s work, learning how to formulate significant questions, developing investigative procedures, gathering and examining evidence, evaluating results, and sharing conclusions with the scientific community. Faculty members also benefit from undergraduate research, might become better teachers.\textsuperscript{18-20}

\textbf{CONCLUSION}

Undergraduate research must be regarded as a fundamental component in medical and dental education for the academic development of medical and dental students for the benefit of future doctors. Undergraduate students must be encouraged to get involved in research and scientific publishing. The objective of undergraduate research is to teach students how to conduct research and to develop necessary skills that can be applied outside the academic environment, to produce competent doctors and enhance patient outcomes. Critical thinking, creation of hypothesis, experimentation, and teamwork are all abilities needed in every day clinical practice that can be acquired by undergraduate research. Undergraduate research can benefit students, faculty members and academic institutions.

\textbf{REFERENCES}

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