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Abstract:	Methods:A systematic analysis was performed of the medical specialization academic programs of 20 different countries to establish which ones take into account mental health comorbidity.The criteria that were explored in the educational programs include:1)name of the medical specialties that take into account mental health comorbidity in curriculum design,2) name of the mental health content addressed by these programs. After independent review and data extraction, paired investigators compared the findings and reached consensus. Descriptive statistics evaluated the frequency of the data presented. Results:Internal medicine, family medicine, neurology, pediatrics and geriatrics were the specialties that included mental health topics in their programs. In four countries: Bangladesh, Serbia, the Netherlands and France, 50%of all graduate specialty training programs include mental health content. In ten countries:Germany, Sweden, the United Kingdom, Mexico, Belgium, India, Russia, Canada, Israel and Spain, between 20%and 49%of all graduate specialty training programs include mental health content. In six countries(Brazil, Chile, Colombia, Croatia, Kenya, and the United States)less than 20%of all graduate specialty training programs include mental health content. Discussion:The proposal that we have made in this article should be taken into account by decision-makers, in order to complement the different postgraduate training programs with mental health comorbidity that are frequently present with other physical symptoms.It is not our intention that the different specialists know how to treat psychiatric comorbidities, but rather pay attention to their existence and implications in the diagnosis, evolution and prognosis of many other diseases.

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ABSTRACT

Methods: A systematic analysis was performed of the medical specialization academic programs of 20 different countries to establish which medical specialties take into account mental health issues in the specialty curricular design and which mental health content these programs address. The criteria that were explored in the educational programs include: 1) name of the medical specialties that take into account mental health content in curriculum design, 2) name of the mental health issues addressed by these programs. After independent review and data extraction, paired investigators compared the findings and reached consensus on all discrepancies before the final presentation of the data. Descriptive statistics evaluated the frequency of the data presented.

Results: Internal medicine, family medicine, neurology, pediatrics and geriatrics were the specialties that included mental health topics in their programs. In four countries: Bangladesh, Serbia, the Netherlands and France, 50%of all graduate specialty training programs include mental health content. In ten countries: Germany, Sweden, the United Kingdom, Mexico, Belgium, India, Russia, Canada, Israel and Spain, between 20%and 49%of all graduate specialty training programs include mental health content. In six countries - Brazil, Chile, Colombia, Croatia, Kenya, and the United States-less than 20%of all graduate specialty training programs include mental health content.

Discussion: The proposal that we have made in this article should be taken into account by decision-makers, in order to complement the different postgraduate training programs with mental health issues that are frequently present with other physical symptoms. It is not our intention that the different specialists know how to treat psychiatric comorbidities, but rather pay attention to their existence and implications in the diagnosis, evolution and prognosis of many other diseases. The current fragmentation of medicine into ever finer specialties makes the management of comorbidity ever more difficult: a reorientation of post- graduate training might improve the situation.

1.- Introduction

The management of comorbidity and emerging diseases are the main challenges for medicine in the 21st century. The first requires, as a first step, changes in the organization of health services and in the training of health workers. While the second should be addressed by improving research aimed at the prevention and treatment of emerging diseases

The increasing prevalence of chronic illnesses has been accompanied by a concomitant increase in comorbidity (co-occurrence of two or more chronic health conditions). The success in prolonging life expectancy did not greatly increase the number of disease-free years: the years gained are years in which people tend to suffer from a variety of chronic diseases, impairments and disabilities. The simultaneous presence of comorbid diseases usually predicts a poorer prognosis for both conditions; it can lead to a greater number of complications, and makes treatment more complex[1-2] and expensive [3]. It is important to point out the difference between comorbidity as the start of another clinical entity in the course of an existing disease, and multimorbidity, defined as the coexistence of several diseases with varying degrees of association in the same individual[4].

In 2019, according to the Global Burden of Disease Collaborators, mental disorders are among the top ten factors that produced the highest number of disability-adjusted life years in the world in the last 30 years[5]. Despite the fact that diseases such as ischemic heart disease, diabetes, stroke, chronic kidney disease and lung cancer are in the first places; mental disorders are often comorbid with such noncommunicable diseases, which worsens their prognosis and the increasing costs associated with their treatment. In addition to the fact that people with mental disorders live 10 years less than people without mental disorders, and non-communicable diseases are the leading cause of their death.

Adults with medical multimorbidity, usually defined as ≥2 concurrent chronic conditions – for example cardiovascular disease and diabetes – ([6-7], have high rates of healthcare utilization and associated costs[8].

The comorbidity of mental-physical diseases has become a major problem in medical practice, as it is present in approximately 30% of individuals[9]. In persons over the age of 60, comorbidity has become the rule rather than an exception[10-11]. Scott et al[12] analyzed 17 countries from the World Mental Health survey and reported a consistent pattern of associations between mental disorders and subsequent development of chronic medical

conditions, with odds ratios ranging from 1.2 (95% CI, 1.0-1.5) to 3.6 (95% CI, 2.0-6.6). Recent research indicates a bidirectional relationship with common risk factors (eg, adverse experiences in early childhood) and shared etiopathogenesis, and the results of the others impact through neurohormonal and behavioral pathways among some of the noncommunicable diseases and mental disorders (eg, depression). The pathways linking mental and physical comorbidity are complex and bidirectional such that, a physical disorder may cause a mental one[12-14], a mental disorder may place a person at risk for a physical one, and some mental and physical disorders share risk factors, such as chronic stressful social life situations, physical inactivity, overweight, smoking, substance use disorders and endocrine dysregulation. Additionally, social conditions like poverty and adverse life events are risk factors for both types of conditions, perhaps due to biological mechanisms and an unfavorable environment.

The relationship of mental-physical disorders holds the potential for a population health index that can gauge the effect of prevention programs at the community level. A study by Cawthorpe found the median cost of physical disorders to be 2.9 times higher in the group with any International Classification of Diseases psychiatric disorder, in comparison with the group without psychiatric disorder[15]. In the USA, a major study of 30,022 adults showed that the risk of functional disability in people with diabetes was 2.42 times higher than in people without diabetes; that in people with depression alone it was 3 times higher than in people without depression; and that the risk for those who had depression and diabetes, the risk was 7.15 times higher than for people who had neither diagnosis[16]. When depression is present, the cost of treating diabetes is 4.5 times higher[17].

Living with medical comorbidity often includes taking multiple prescription medications and careful management of individual illnesses. Comorbid substance use disorder (SUD) can have profound negative effects on pre-existing chronic diseases, since different substances of abuse have been associated with a wide range of physiological effects (cardiovascular, gastrointestinal, hematological, pulmonary and neurological) that complicate the evolution, clinical management and prognosis of chronic diseases. Furthermore, many adults who are in treatment for SUD receive fragmented medical care for their other chronic conditions[18].

Chronic medical diseases, mental illness, and substance use frequently are interrelated and represent a compound multimorbidity placing individuals at even higher risk for adverse

outcomes including increases in healthcare utilization. Therefore, such comorbidity must be taken into account when developing effective care for medical comorbidity[19].

While the association between physical and mental disorders continues to grow, medicine is fragmenting into increasingly limited specialties. There are few residency programs that train in evaluation and assessment of mental disorders (like internal medicine) and their training is often inadequate or incomplete[20]. While clinicians may be aware of comorbidity, they may also feel pressed for time and powerless to handle problems, as well as lacking confidence or strategies to address all problems. Training should take into account that doctors can control and limit the interview as a way to avoid emotional difficulties. In other words, physicians increasingly treat problems and / or disorders in which they received little training during residency.

A solution from medical education consists of developing and implementing a comprehensive curriculum in physical and mental comorbidity during training as medical specialists[20]. The context of the current pandemic, followed by extensive restrictive public health measures (such as isolation, quarantine, and monitoring) can cause significant distress resulting in the emergence of mental disorders such as depression in previously unaffected populations. Therefore, the current context demands a call for a significant change in the education of residents in practical skills to manage common difficulties of patients, such as anxiety, depression, substance abuse and chronic pain[21]. In addition, there is a gap in the literature related to the evidence for the integration of medico-mental comorbidity into the medical residency program and how these curricula can meet training needs[22].

The only way to ensure an appropriate attitude towards comprehensive patient care, in any medical specialty, is to work in a cooperative and interdisciplinary manner. Therefore, the training must incorporate some explanation of the comorbidity and the potentially dangerous implications of not identifying it within the consultation.

The biopsychosocial model of health care, awareness of comorbidity (physical-mental) inclusive approaches on promotion and prevention aspects in mental health, doctor-patient relationship and ethics should be included in the different training programs.

The current fragmentation of medicine into increasingly fine specialties makes the management of comorbidity even more difficult: a reorientation of postgraduate training could improve the situation. In our current context, a reorientation in the curriculum is urgent, since

health care providers have an essential role in the treatment of emotional outcomes as part of the response to the pandemic COVID-19 and control measures (eg quarantine and distancing Social). Future specialists need to acquire sufficient knowledge to diagnose and treat (or refer) common psychiatric diseases. The main objective of this study was to establish which medical specialties take mental health into account in the design of their training programs, and what mental health topics they address.

2.- Methods.

This document analysis systematically analyzed the medical specialization academic programs of 20 different countries. The searching criteria that were explored in the educational programs include:

1. Which specialty programs addressing mental health comorbidity in their training program?
2. How many specialties include the following mental health comorbidity in their regular postgraduate program: affective disorders, anxiety disorders, substance use disorders, and alcohol use disorders?
3. What other mental health topics are included in the different medical specialty programs?

Operational definition. Mental health content was defined as the specific mention in the curriculum of each academic program of depressive, anxiety, substance use disorders comorbid with medical pathology. As well as the express mention of the study of the doctor-patient relationship in the practice of the specialty.

2.1. Document collection

For each of the 20 countries: 1. all medical schools in the country were searched, 2.- once all schools were identified by country, all graduate programs associated with each school were identified, and 3.- then their study plan for each of the programs was analyzed.

Study plan and medical specialty programs were requested through invitations, searches on institutional websites and communications from all medical schools in the participating countries. For countries with multiple medical schools, each website was independently

searched for relevant documents. To be included in the analysis, documents had to be retrievable from an institution. Otherwise, schools were excluded from the study.

2.2 Data extraction process

The data extraction form was created in Excel and was designed to extract documented information. The majority of items on the form appeared as check- boxes to indicate the presence or absence of criteria. Those related to the proposed criteria were extracted for analysis. The initial draft of the data extraction form was created by three coauthors (GH, DPGS, NB), and was subsequently reviewed and revised by four groups of four investigators (16 investigators in total) extracted data from the available papers using the final form. After independently extracting the data, each group of investigators compared the entries, resolved discrepancies by consensus, and submitted a final data extraction form for each medical school reviewed.

Data were organized and analyzed using IBM SPSS statistical software, version 26 (IBM Corporation, New York, NY, USA). Descriptive statistics evaluated the frequency of the data presented.

3.- Results

The materials describing 1036 postgraduate specialty programs that were examined showed that internal medicine, family medicine, neurology, pediatrics and geriatrics were the specialties that included mental health topics in their programs with some differences between the 20 countries, for example: Neurology include mental health comorbidity on 17 different countries vs Geriatrics that include mental health comorbidity on 8 different countries (See Figure 1).

INSERT FIGURE 1

The percentages of mental health content found in the postgraduate programs from the 20 countries included in this survey were: 1) In four countries: Bangladesh, Serbia, the Netherlands, and France, over 50% of all postgraduate specialty training programs included

mental health content; 2) In ten countries: Germany, Sweden, United Kingdom, Mexico, Belgium, India, Russia, Canada, Israel, and Spain, between 20%-49% of all postgraduate specialty training programs included mental health content; 3) In six countries: Brazil, Chile, Colombia, Croatia, Kenya, and the United States, 20% of all postgraduate specialty training programs included mental health content. (See Figure 2)

INSERT FIGURE 2

Croatia and Russia do not have medical specialties that include affective disorders in their academic programs. Belgium, Brazil and Kenya do not have medical specialties that include psychosomatic disorders in their academic programs, whereas Germany, France and Croatia do not include anxiety disorders in their academic specialty programs. Bangladesh, Mexico, the Netherlands, Israel, Serbia, and Spain include mental health issues in more than 10 of their medical specialty programs (see Figure 3).

INSERT FIGURE 3

Brazil, Croatia and Russia do not have medical specialties that include substance use disorders (SUD) or alcohol use disorder (AUD) in their academic programs. None of the medical specialty programs in Kenya include AUD. Belgium, Chile, Colombia, England, France, Germany, and the United States do include AUD and SUD, but only in less than five medical specialty programs. (See Figure 4)

INSERT FIGURE 4

In Serbia, Mexico, Bangladesh, the Netherlands, Russia, England, France, Sweden, and Spain, more than 10 different programs address other mental health topics, such as the doctor-patient relationship, violence, medical ethics, medical responsibility, neuropsychological syndromes, etc.

4.- Discussion

It is of great concern that only four of the 20 countries in our study contemplate mental health in over 50% of their postgraduate specialty training programs, while this percentage falls below 20% in six countries.

In recent years, the increasing prevalence of chronic, often comorbid conditions requires that patients receive care from multiple providers in a variety of settings. Intensified specialization has sought to generate greater interdependence among clinicians and promote cross-fragment coordination, however, it has exacerbated fragmentation by increasing the number of narrowly trained specialists. “Fragmentation" in healthcare services means a systemic lack of coordination that spawns inefficient allocation of material and human resources. Fragmentation adversely impacts quality, cost, and outcomes[14]. The healthcare system is suffering from what George Halvorson calls “clinical linkage deficiencies”[23]. This systemic fragmentation is difficult to dislodge, because it is steeped in the history and culture of medicine and embedded population-wide within the current system — operationally, financially, and in the clinic.

The comorbidity of a mental and physical condition may impact the mode of presentation, clinical severity, response to treatment, and burden of illness of both conditions. New insights in biology, physics, human organization, and other fields have led to understanding complex systems as more than the sum of their parts[24]. However, because of our fragmented understanding of the natural world, systems, and human interactions, health care has not kept up with these advances[25]. Specialized information has expanded without an accompanying expansion in our ability to integrate, prioritize, and personalize narrowly construed information.

Fragmentation often involves multiple providers and organizations, with deficient coordination among the parties, that may lead to suboptimal care, including important healthcare issues being inadequately addressed, poor patient outcomes, and unnecessary or even harmful services that ultimately both raise costs and degrade quality[26-27].

Research evidence consistently demonstrates that people with chronic diseases are two to three times more likely to experience mental health problems than the general population[18, 28-29]. As a result of this comorbidity, both the prognosis for their chronic condition and the quality of life they experience can deteriorate markedly. In addition, the costs of providing care for this group of people are increased as a result of less effective self-care and other complicating factors related to poor mental health. The mechanisms underlying this type of comorbidity are complex, and evidence suggests that a combination of biological, psychosocial, environmental, and behavioral factors may be at play[28].

Medical specialization (ME) plays a key role in contemporary medicine and the role of the specialist should not be questioned. ME emerged as a result of the shift to pathological anatomy (medical model divides the body into parts in which different types of doctors have to specialize), the emergence of medical technologies, and due to urbanization. Specialization is a way to improve healthcare outcomes, by applying greater knowledge and experience on specific diagnostic and therapeutic problems. This represented important advances in the treatment of diseases previously considered incurable, as well as in increasing life expectancy. Adequate communication between specialists is essential to avoid distancing from integrated medicine

In particular, cardiology, endocrinology, pneumology, infectiology, rehabilitation medicine, and orthopedics do not include mental health content in their academic programs. In the majority of the surveyed countries, there is strong clinical evidence that these specialties may benefit from teaching mental health topics to postgraduate residents, given their close relationship with cardiovascular diseases, diabetes, chronic obstructive pulmonary disease (COPD), and chronic musculoskeletal disorders[30-36].

Cardiovascular prognosis is less favorable for patients with comorbid mental health diseases, for instance, an association with depression increases acute exacerbations per year by 50%, as well as mortality rates[31-34]. People with comorbid diabetes-depression have an increased risk (> 20%) of unfavorable health outcomes and premature mortality[30, 34]. Mental illness can also have a major impact on symptoms and outcomes for people with COPD (regardless of it severity): psychiatric comorbidity in these patients is associated with poorer health status, increased breathlessness, and an increase in mortality rates[30, 36-40]. There is also evidence for a higher prevalence of mental disorders among people with other conditions, including asthma, arthritis, cancer, HIV/AIDS, and others[37,38].

Finally, it is also important to take into account child maltreatment (CM) as the most important preventable cause of psychopathology. There is a palpable relationship between adversity early in life and adult health status[38].

Studies show that comprehensive care that avoids diagnostic-therapeutic fragmentation improves a patient's evolution, prognosis and quality of life[4, 9-10]. Appropriate management of mental and somatic comorbidity, at the individual and at the public health level, will require a significant reorientation of medical education.

Psychiatrists are no better than other specialists at identifying comorbid conditions. This is most clearly demonstrated in the creation of a sub-discipline called liaison psychiatry. No other medical discipline has a similar subspecialty; there is no liaison cardiology or pulmonology because any specialist is expected to deal with the physical problems of their patients. Psychiatrists often overlook or under-treat a comorbid physical illness, omitting a medical examination that could inform them of the presence of another illness. Given that cardiovascular, cancer, neonatal and musculoskeletal disorders rank above mental health morbidity statistics worldwide, it is expected that in the future psychiatrists will acquire sufficient knowledge to diagnose and treat (or refer) non-psychiatric diseases and that, therefore, the discipline liaison psychiatry is unnecessary. We are still far from this goal. The academic training program of a psychiatrist must be based on an epidemiological profile and include the most common chronic degenerative diseases. A future study regarding the inclusion of physical health content in psychiatric training would be interesting in the future.

Worldwide efforts are needed to convince decision makers, educators, clinicians, healthcare institutions, and insurance providers, not only that mental-physical comorbidity is not an exception but nearly a rule, but also that it constitutes one of the most urgent challenges for public health authorities.

Not only should undergraduate education be a target for the objective of integration, it is therefore unavoidable that specialists in all disciplines also assume some responsibility for dealing with the issue of mental comorbidity in the patients whom they treat.

Education and training on psychosocial issues should be provided to health system leaders and health professionals on the front line of COVID care. Some patients will need a referral for formal mental health assessment and treatment, in some cases immediate (suicidality), while others may benefit from supportive interventions designed to promote well-being and improve coping. In addition, there should be no substantial differences in the treatment of COVID-19 infection between patients with a previous diagnosis of a mental disorder and those without a diagnosis of mental disorder.

5.- Conclusion

Comorbidity is a term that has been borrowed from physical medicine. Its original meaning indicated the presence of at least two diseases. The co-occurrence of these diseases

complicates diagnosis and treatment; and raises questions about the etiology and the mutual interdependence of diseases[36, 39]. This in turn calls for the involvement of different medical specialties in patient care, in order to clarify the questions raised and provide comprehensive treatment.

The challenges of responding effectively to compounded mental and physical health needs are part of a larger problem regarding the care for people with comorbidities of any kind. Current service models are often orientated around single diseases and fail to provide well-coordinated care to a great and growing number of people with multiple health problems.

For physicians it must be fundamental to treat each patient as a whole. At present, however, specialist doctors tend to focus only on their particular area of study, making it impossible to care adequately for patients who have other types of health problems. It thus becomes especially important for primary care physicians to understand the bases of attention in psychiatry, as they are the first point of contact for patients. Knowing how to identify psychiatric pathology would enable primary care physicians to detect it opportunely, prescribe initial treatment, and adequately refer cases that need more specialized attention.

No method can be developed to reliably determine the quality of psychiatric education and training worldwide because each country has its own epidemiology of mental illness. However, it is recommended that the institutions that regulate postgraduate curricula in each country consider the incidence and prevalence of these diseases in order to include them in the curricula of different specialties, paying special attention to psychiatric education for residents of primary care medicine. It is desirable to include mental health topics, as well as rotations in the psychiatric clinic area[36], in postgraduate curricula as befits the needs of each country, so that psychiatrists and other specialists share the responsibility of detecting and treating mental illness opportunely.

Some specific mental health topics could be added to the curriculum in many countries carefully according to epidemiological needs, avoiding their impact on other aspects of the program. The curriculum is a zero-sum game, which means adding one thing may require removing another.

Awareness of mental health must be integrated into all aspects of health and social policy, into the planning of the healthcare system and into the provision of primary & secondary healthcare. The proposal is to integrate (within medical training programs) common mental

health problems in the routine care of people affected by other chronic non-communicable diseases (such as cancer, diabetes and cardiovascular disorders), HIV / AIDS and maternal health care. Integrating physical and mental comorbidity into medical education programs offers the opportunity to treat " the whole patient ", with a better overall cost-effectiveness than an approach in which mental health, acute physical health and Chronic, reproductive health problems, infectious and chronic pain are addressed without effective knowledge and communication among health professionals. An integrated care model is often more attractive to patients and family members who are concerned about the stigma that is still associated with mental and substance abuse disorders.

The proposal of the present article is to complement the pre-existing programs with annotations in mental health, since it is not intended that the different specialist doctors know how to treat all psychiatric diagnoses, but that they know their existence, implications in the diagnosis and prognosis of other diseases, as well as the changes in the clinical evolution generated by the medical and mental comorbidity.

An integrated medical education approach to address mental health in for example: the context of HIV care, maternal mental health, and chronic non-communicable diseases is based on the conviction and growing evidence of the efficiency, effectiveness, and cost savings of an integrated medical care[41]. Prevention and early intervention also reduce the global burden of mental and physical comorbidity. An integrated approach that seeks to prevent conditions that affect mental and physical health would share common strategies; for example, reducing alcohol consumption and smoking and promote physically active lifestyles[42].

Finally, we must not forget that the mental health implications of the COVID-19 pandemic (protecting people with mental disorders from COVID-19, the anticipated increase in mental disorders throughout the population, and the neuropsychiatric consequences of the disease) require a greater focus on public interventions mental health. The notion that only psychiatrists can provide treatment must be abandoned. Other forms of collaborative and community-based approaches are required, through training of the general practitioner and specialists.

6.- Contributors

GH, NS, DGS, NBF were responsible for the literature search, figures, study design, data collection, data analysis, data interpretation, and writing. The rest of the authors contributed equally to data collection, data interpretation, and writing.

7.- Conflicts of interest

Al the authors declare no conflicts of interest.

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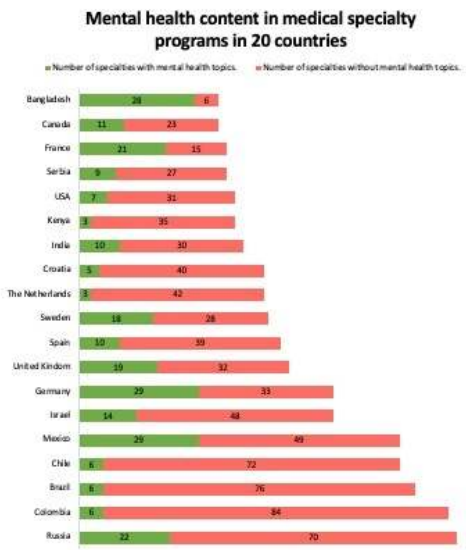

Figure 2.Number of medical specialties by country addressing mental health comorbidity: affective and anxiety disorders

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Figure 1. The main five specialty programs with mental health topics: distribution by countries.

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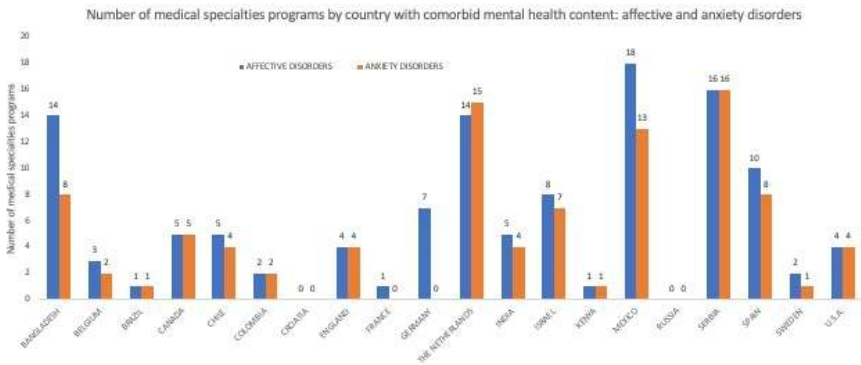

Figure 3. Number of medical specialties programs by country with comorbid mental health content: affective and anxiety disorders

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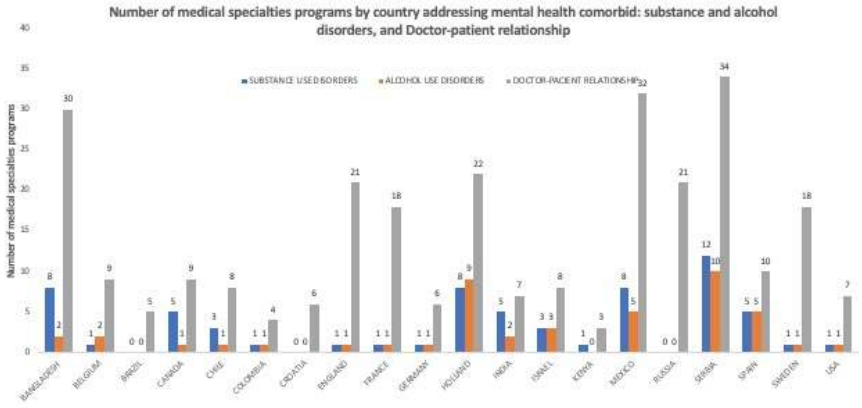

Figure 4. Number of medical specialties programs by country addressing mental health comorbid: substance and alcohol disorders, and Doctor-patient relationship

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