MEDEX

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In this issue:

The congress was hold on May 27-28, 2021 by the initiative of the Department of Clinical Pharmacology of the Astana Medical University, the Department of Clinical Pharmacology and Evidence-Based Medicine of the Medical University of Karaganda, the Department of Pharmacology of the Semey Medical University, Department of Clinical Pharmacology KAZNMU “S.D. Asfendiyarov", Department of Pharmacology, Department of General and Clinical Pharmacology KazMNO, Almaty.

Dates and venue: Kazakhstan, Nur-Sultan, Almaty

Organizers: Ministry of Health of the Republic of Kazakhstan, NJSC "Astana Medical University", NJSC "KAZNMU named after S.D. Asfendiyarov "

Chairman of the organizing committee:
Head of the Department of Clinical Pharmacology "Astana Medical University" MD, Akhmadyar N.S.

The work of the congress was carried out in 5 directions:

1. Problems of teaching clinical pharmacology at medical universities of Kazakhstan.
2. Questions of the rational and personalized pharmacotherapy in clinical medicine.
3. Chemotherapy drugs.
4. Pharmacotherapy and prevention of COVID-19.
5. Young scientists competition.

Within the framework of the congress, CoRSUM presented three abstracts and a Plenary Report.

INTERNATIONAL REVIEW OF PHARMACOLOGICAL APPROACHES OF THE MEDICINE REPURPOSING TO THE TREATMENT OF COVID-19 PATIENTS

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Problem statement: The coronavirus disease (COVID-19) pandemic has affected an estimated 61,5 million persons and caused 3.355 million deaths worldwide by May 2021. Since coronavirus disease 2019 (COVID-19) is a serious new worldwide public health crisis with significant morbidity and mortality, effective medicines are urgently needed. At present, specific medicines are not available for the treatment of COVID-19. The discovery and licensed use of a medicine requires a long development and approval period. The cost of new drug development can amount to more than a billion dollars over a period of 10–15 years. Since there is insufficient time to evaluate new drug therapies, drug repurposing may offer a strategy to efficiently control the clinical course of the disease and the spread of pandemic. There is great interest in drug repurposing (also known as repositioning or rediscovery) to accelerate the identification of drugs that can treat or prevent COVID-19. Drug repurposing is the process to identify new indications for existing drugs and is considered to be an efficient and economical approach.

Objective: To evaluate the international pharmacological approaches of medicines repurposing for the treatment or prevention of COVID-19 patients.

Methods: Review the international evidence-based literature evaluating repurposing medicines for COVID-19.

Result: International studies cover two groups medicines: Firstly those with confirmed activity against other viruses or proposed antiviral activity: remdesivir, favipiravir, darunavir, ribavirin, lopinavir, ritonavir, nitazoxanide, elbasvir, tegobuvir, sofosbuvir, bictegravir, IDX-184, ivermectin, prulifloxacin, cepharanthine, nafamostat, nefinavir. Secondly, medicines acting on the host/patient: dexamethasone, prednisolone, methylprednisolone, ARBs, statins, anticoagulants, interferon ß, interferon a2b, tocilizumab, ruxolitinib, baricitinib. Some medicines have shown inhibitory effects against the SARS-CoV2 in- vitro as well as in clinical conditions. These medicines either act through virus-related targets such as RNA genome, polypeptide packing and uptake pathways or target host-related pathways involving angiotensin-converting enzyme-2 (ACE2) receptors and inflammatory pathways.

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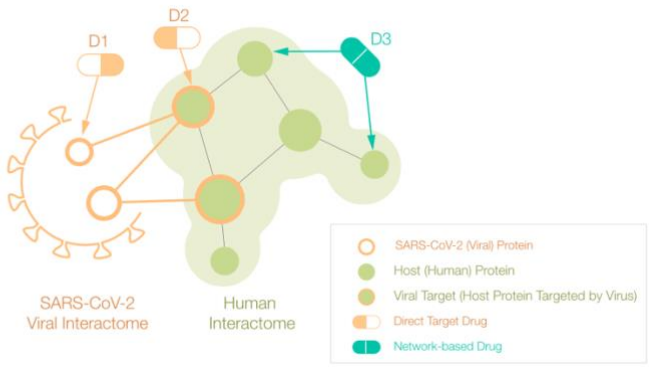

Conclusion: The process of repurposing medicines for the treatment of COVID-10 continues and requires close attention from scientists around the world and rapid coverage of the clinical effect in the evidence-based literature. An effective repurposed medicine will bring significant benefit to the public health systems around the world.

WHAT COULD BE THE MAIN CRITERIA FOR THE AUSTRALIAN THERAPEUTIC GUIDELINES IMPLEMENTATION INTO KAZAKHSTAN?

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Background

Health professionals need reliable and independent therapeutic information to help them make the best decisions for their patients. Therapeutic Guidelines Ltd, based in Australia, is an independent not-for-profit organization. Its aim is to promote the quality use of medicines, and it does this through the writing, publication of Therapeutic Guidelines. Therapeutic Guidelines (TGs) provides information in book and electronic formats to general practitioners, hospital and community pharmacists, specialist medical practitioners, nurses and other allied health staff working in public and private primary, secondary and tertiary health care settings around Australia, as well as to students and registrars in medical, pharmacy and nursing training organizations, including universities and general practice education and training organizations.

Therapeutic Guidelines: products

Aim

To define the basic principles of the structure of the Australian Therapeutic Guidelines that can be applied to Kazakhstan Therapeutic Guidelines development.

Method

Review the basic principles of activities of the Australian Therapeutic Guidelines.

Result

Some of the main criteria for successful activities of Therapeutic Guidelines Ltd can be defined as:

1. TGs are endorsed by NPS MedicineWise, The Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists, The Society of Hospital Pharmacists of Australia, and the International Society of Drug Bulletins.
2. TGs are written principally for prescribers (general practitioners and trainee physicians in particular) to provide clear, practical, succinct and up-to-date therapeutic information, for the management of patients with specific conditions.
3. TGs are based on the latest international literature, interpreted by some of Australia's most eminent and respected experts, with input from an extensive network of general practitioners and other users.
4. TGs information is independent and unbiased and is a distillation of current evidence and opinion.
5. TGs are comprehensive in that they cover all common disorders seen in clinical practice. Topics and sections are arranged according to diagnostic entities.
6. TGs offer access to the guidelines in book and electronic formats

Conclusion

Analysis of the TGL's activities for over forty years has shown its uniqueness and is an indicator of success. This experience should be studied by healthcare professionals in Kazakhstan for the possible creation of a model in the region of the NIS countries.

EXPLORING EFFECTIVE APPROACHES TO IMPROVE COLLABORATION BETWEEN DOCTORS AND PHARMACISTS IN THE HEALTH CARE SETTINGS

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Background
The history of the development of medicine and pharmacy followed parallel paths, both disciplines have similar roots and many common values, but today these two professions have formed different cultures and different areas of practice. The traditional relationship between doctors and pharmacists is unequal and a power gradient is evident, with medicine as the dominant profession, afforded by societal perceptions of physicians as saving lives and curing diseases. Despite the potential to contribute to patient safety, the pharmacist's role in Newly Independent States is seen as subordinate to the physician's role. In keeping with this power gradient, most pharmacists are reluctant to question a physician's authority and opinion about prescribing even though they have a more detailed knowledge of medicine properties, interactions and adverse drug reactions, by virtue of their education and training. This entrenched hierarchical relationship between pharmacy and medicine makes it difficult to establish practice that is truly collaborative. While poor communication between doctors and pharmacists is a major cause of medical errors, it is clear that effective, deliberate doctor-pharmacist collaboration within certain health clinical settings significantly improves patient care.

Aim: to identify evidence that interprofessional education can improve collaboration between medical doctors and pharmacists and can be applied to health care settings in Newly Independent States.

Methods: A literature search in PubMed, Google Scholar was conducted to identify relevant studies.

Result:
Doctors and pharmacists have specialised knowledge and skills, with the common goal of improving patient care. Relationships between these two professions can be strengthened by means of collaboration. Along with various strategies aimed at improving communication between doctors and pharmacists, the experience of joint training of medical students and pharmacists is of certain interest. By creating an inter-professional learning environment for undergraduate students, medical students and pharmacists have the opportunity to start working together early in their careers. Such training programs have been established at universities in South Africa, Australia, Spain, Italy, New Zealand and the United States. Collaborative learning between healthcare professionals improves the efficiency of the healthcare system through shared integration of skills and knowledge. It also leads to the development of mutual respect and identifies new roles and responsibilities of team members.

Conclusion: The promotion of an interprofessional undergraduate learning environment offers health science students an opportunity to work in a collaborative manner early on in their careers. This co-operative setting may prevent stereotyped and negative attitudes that students may develop towards other professions.

Oxana Ryshchenko became a new member of CoRSUM in May 2021. We are delighted to welcome a new active member and look forward to a fruitful collaboration.

FEATURES OF PALLIATIVE CARE OF PATIENTS WITH CHRONIC PAIN SYNDROME FROM THE POSITION OF SOCIAL PHARMACY

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The article presents the results of studying the features of providing palliative care to patients with chronic pain syndrome from the standpoint of legal regulation. The medico-pharmaceutical and social components of palliative care and the possibility of using adjuvant drugs, which do not exhibit an analgesic effect by their pharmacological properties, are highlighted in order to potentiate and prolong the basic pharmacotherapy of chronic pain syndrome.
Key words: palliative care, adjuvant drugs, chronic pain syndrome.

Health care reform in Ukraine is aimed at increasing the level of availability of medicines for each patient. It reaches by optimizing the use of budgeting funds in health protection institution (HPI); by refocusing of financing of beds to pay for real services received by a "real person". It also reaches by ensuring social justice, which provides equal and transparent access to timely, effective, high-quality and safe medical services for all patients, depending on the type of disease in accordance with the International Classification of Diseases 10th revision (ICD-10), standards and treatment protocols.

This is especially important in the provision of medical and pharmaceutical care to patients whose diseases are incurable (in the final stage of the disease) and accompanied by the development of pain syndrome (PS). For such categories of patients, there is a separate type of medical and pharmaceutical care – palliative care (PC). The analysis of world experience in the care development for people with serious incurable diseases and limited longevity (prognosis) allows us to make definite conclusion. According to modern concepts, palliative patients in the terminal period of life (6 months to a year) must be subject to professional palliative care, medical and pharmaceutical, social and economic, psychological and pedagogical care and provision, which is carried out in specialized inpatient institutions – hospices and palliative care units of HPI.

The aim of the research was to study the features of palliative care for patients with pain syndrome, in its medical and pharmaceutical direction, taking into account the principles of social pharmacy.

Materials and methods of research

The materials of the study were the legislation of health care of Ukraine on the provision of PC to patients: the Constitution of Ukraine, laws of Ukraine, orders of the Ministry of Health of Ukraine, state, regional and local formularies, and medical and technological documentation which is represented by a unified clinical protocol of palliative care for chronic pain syndrome and its fragments – primary and secondary care. The regulatory method, documentary method and method of data systematization were used as research methods. Graphic and tabular methods used for more visual representation of the obtained data of research.

Results and discussion

According to a study of the international organization Human Rights Watch, more than 400,000 people in Ukraine need PC and pharmacotherapy of PS to relieve the symptoms of incurable diseases. Among them are patients suffering from oncological, cardiovascular and cerebrovascular diseases, tuberculosis, degenerative senile brain lesions, severe genetic

pathology, etc. in the final period of life.

To ensure the appropriate level of PC to the relevant categories of patients at the legislative level of health care, a number of normative-legal and medical-technological documents regulating the procedure of PC providing to patients have been developed and implemented in medical and pharmaceutical practice.

Among them are: the PC qualification as special type of medical and pharmaceutical care for the relevant categories of patients according with European standards and the allocation of the concept of palliative patient; features of the order of medicines turnover for palliative patients; establishing a list of medicines used for PC, as well as the organization of PC and adequate anesthesia, optimization of symptomatic treatment and rehabilitation of patients with PS, improving the quality of life of the patient and caregivers.

The main difference between the provision of PC, according to which it is allocated to a special type of medical and pharmaceutical care, is that it is not aimed at the patient's recovery, but provides an adequate level of his life quality and environment, which can be provided both at home and in hospital units. Palliative care includes several components that can be grouped into two areas: medico-pharmaceutical and social, which is presented in Fig. 1.

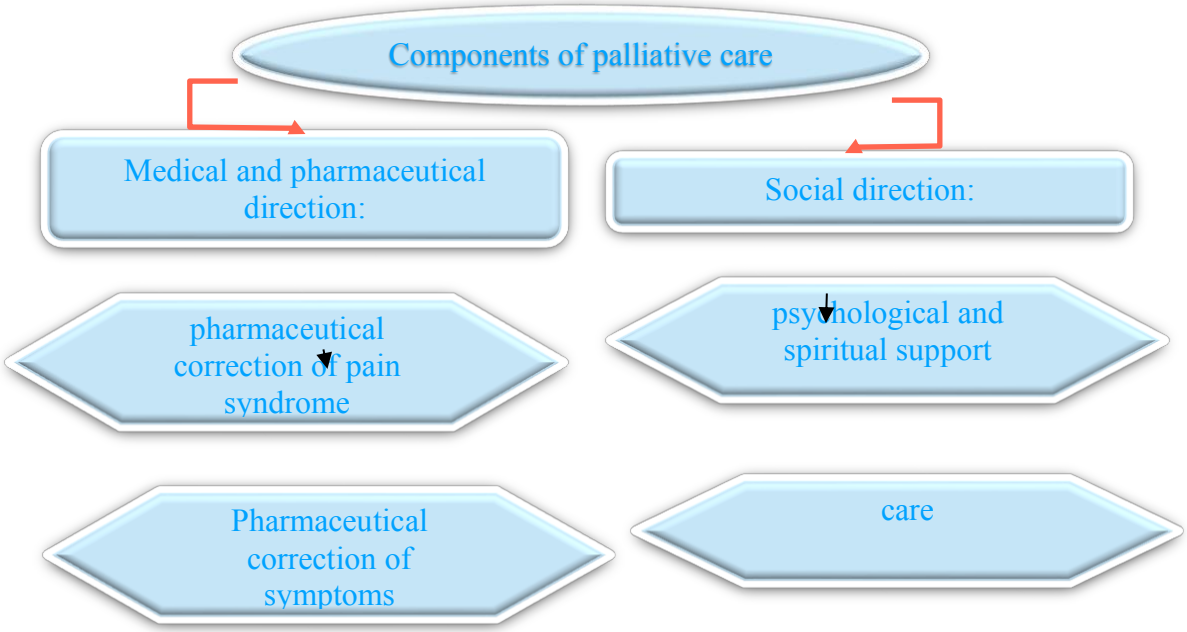

Fig. 1. The main components of palliative care [10]

Figure 1 shows that PC involves not only the provision of medical and pharmaceutical care, but also the use of non-medical methods of care, which include psychological, spiritual support of the patient and his relatives, care for him.

The main component of PC in the medical and pharmaceutical field is the pharmacotherapy of PS in patients who need PC. For this purpose, analgesic drugs of several clinical and pharmacological groups (CPhG) are used:

- ✓ anti-inflammatory and anti-rheumatic drugs (ATC code: M01);
- ✓ non-narcotic analgesics (ATC code: N02B);
- ✓ narcotic (opioid) analgesics (ATC code: N02A);
- ✓ adjuvant drugs, which optimizes and enhances the action of analgesics.

Depending on the intensity of PS in the patient, analgesic drugs used for pharmaceutical correction of PS are divided into three levels of analgesia (Table 1). The main criterion for this distribution is the degree of PS intensity in the patient.

Table 1

Drugs used for pharmacotherapy of pain, according to the level of analgesia

Level of anesthesia	Pain intensity	Example of drugs by INN	CPhG
1st level of anesthesia	mild pain	acetylsalicylic acid, paracetamol	non-narcotic analgesics
		diclofenac sodium	anti-inflammatory and anti-rheumatic drugs
2nd level of anesthesia	moderate pain	codeine, tramadol	narcotic (opioid) analgesics of mild action
3rd level of anesthesia	severe pain	morphine hydrochloride, buprenorphine hydrochloride	narcotic (opioid) analgesics of strong action

Note: INN is an international non-proprietary name of a medicinal product

Thus, in pharmacotherapy of PS in patients with PC, it is possible to use analgesic drugs of different clinical and pharmacological groups depending on the intensity of pain. In order to potentiate and prolong analgesic pharmacotherapy at all levels of PS analgesia, it is recommended to use adjuvant drugs of different clinical and pharmacological groups, which are drugs that help relieve PS and are used against the background of basic analgesic pharmacotherapy. According to their pharmacological properties, adjuvant drugs do not show a direct analgesic effect, and due to their neuro- and psychotropic action can increase the effectiveness of drugs with a purely analgesic effect, which expands the therapeutic range of the analgesics. However, due to the diversity of clinical and pharmacological groups of adjuvant drugs, they may differ in the order of turnover (purchase, storage, use) in accordance with the requirements of current medical and pharmaceutical legislation, which greatly complicates the work of medical and pharmaceutical staff.

It should be noted that in the WHO recommendations and in the domestic medical and technological documentation on the procedure for providing PC there is no single list of drugs (for INN) that could be used as adjuvant pharmacotherapy of PS. The WHO recommendations for anesthesia for palliative patients list only the clinical and pharmacological groups of drugs recommended for use in adjuvant pharmacotherapy.

In Ukraine, in order to streamline the PC to the relevant categories of patients provided for budget funds in the State list of drugs, along with lists of drugs for each category of palliative patients, formed a list of drugs for PC. This list in addition to analgesic drugs contained 8 major clinical pharmacological groups of drugs that can be used as adjuvant pharmacotherapy: drugs that affect the central nervous system (antiepileptic drugs (ATC code: N03A), psycholeptics (ATC code: N05) and psychoanaleptics (ATC code: N06)), agents affecting the digestive system and metabolism (ATC code: A), respiratory system (ATC code: R06), cardiovascular system (ATC code: C), musculoskeletal system (ATC code: M05) and hormonal agents for systemic use (ATC code: H02A). It should be noted that due to their pharmacological properties, drugs belonging to these clinical and pharmacological groups do not show analgesic effect and, accordingly, in the indications for medical use, which are specified in the instructions for medical use, there is no indication of their use as adjuvant or analgesic pharmacotherapy.

The obtained results indicate the need to amend the medical and technological documentation for the provision of PC by creating an official list of drugs at the state level, which can be used as adjuvant pharmacotherapy and improve the instructions for medical use of drugs included in this list.

Conclusions

According to the results of the research, a study of the features of PC as a special type of medical and pharmaceutical care. It has been established that the objects of PC are patients with diseases that are accompanied by the development of PS of varying intensity. The main components of PC as

a complex type of pharmacotherapy, which includes two areas: medical-pharmaceutical and social. The study of medical and pharmaceutical direction of PC to patients with PS identified the main clinical and pharmacological groups of analgesic drugs, including anti-inflammatory and antirheumatic drugs, non-narcotic analgesics and narcotic (opioid) analgesics, which depending on the intensity of PS in the patient are divided into three levels. It is established that in order to potentiate and prolong the basic pharmacotherapy of PS, it is possible to use adjuvant drugs, which by their pharmacological properties do not show a direct analgesic effect. According to the results of systematization of the list of drugs, which are specified in the State form of drugs, 8 clinical and pharmacological groups of drugs are selected, which are systematized in accordance with the international anatomical and therapeutic chemical classification system of ATC. The study highlighted the need to amend the medical and technological documentation for the provision of PC by creating an official list of drugs at the state level that can be used as adjuvant pharmacotherapy and improving the instructions for medical use of drugs included in this list.

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Pharm.D.s in the Midst of M.D.s and Ph.D.s: the Importance of Pharmacists in Medical Education

Medical Science Educator (2018) 28:259–261

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The pharmaceutical industry is booming. According to Forbes magazine, 2015 was a remarkable year for pharmaceutical innovation, in which the number of new drugs approved surpassed every year since 1950 [1]. There has been an exponential growth in biological agents used for targeted therapy, and pharmacogenomics is now transforming drug selection for many disease states. Pharmacology is a challenging subject to teach and learn, and with the record number of 45 new medications approved in 2015 by the U.S. Food and Drug Administration, pharmacology education will only become more challenging [1]. With a steady growth of novel drug treatments, immunologic and biologic agents, and the expanding role of pharmacogenetics, the amount of time de- voted to pharmacotherapy education in the medical school curriculum should theoretically increase, but several studies have reported that undergraduate medical pharmacology train- ing is insufficient [2]. Medical students should be provided with appropriate education to ensure optimal clinical out- comes with the prescribed therapy.

According to the American College of Clinical Pharmacy (ACCP), prescribers are not always appropriately educated to administer and monitor currently available therapeutics [2]. ACCP believes there is an urgent need to improve and expand clinical pharmacology education for undergraduate physicians [2]. The World Health Organization also believes that healthcare professionals who prescribe medications need better education in clinical pharmacotherapy to help prevent prescription errors and reduce the incidence of adverse events [2]. In “Tomorrow’s Doctors,” the General Medical Council’s guidance on undergraduate medical education emphasized the importance of integrating clinical pharmacology and therapeutics teaching within the medical school curriculum [3]. Overall, it seems clear that pharmacology education in the medical school curriculum must improve, as insufficient knowledge about commonly used medications or the confidence to apply this knowledge will make it difficult for our future physicians to provide safe and effective patient care.

Students may not feel confident in their pharmaceutical education for many reasons. Making a connection between the basic biomedical sciences and clinical application to patient cases is challenging. Even practicing physicians and pharmacists often find it difficult to integrate basic science concepts with clinically relevant scenarios. While it is extremely important for students to connect the pharmacology taught at the beginning of the curriculum to the translational application of pharmacotherapeutics taught during their clerkship years, it is often considered an overwhelming task. For example, simply learning about the mechanism of action and adverse effects of a medication does not make it easy to effectively utilize that knowledge in a clinical setting years down the road. Students may also not feel confident in their pharmaceutical knowledge due to a lack of early clinical exposure, in which the development of prescribing skills may require contextual variables presented by real patients, such as comorbidities or challenging home situations [4]. Tichelaar and colleagues found that medical students tend to copy the drug treatment choices of their teachers during clinical clerkships, instead of selecting an appropriate treatment based on their own independent analysis of the patient [5]. A lack in confidence in their ability to independently choose a safe and effective medication may be due to the lack of certainty in their ability to connect the basic and clinical sciences. This could potentially lead to further problems in which medical residents may not feel adequately prepared to prescribe after graduating from medical school [6].

Clinical pharmacists, experts in drug therapy, can play a key role in improving pharmacology education and increasing the confidence that medical students have in their ability to select appropriate therapy. The knowledge that clinical pharmacists share has led to better use of medications, increased cost-effectiveness, optimized clinical outcomes, and improved patient care [7].

Post-graduate training through residencies and fellowships has allowed many pharmacists to receive extra clinical training. As a result, they are

much more involved in direct patient care such as participating in daily rounds with physician teams. In some states, clinical pharmacists are even legally recognized as independent providers [8]. Clinical pharmacists have a comprehensive knowledge of medications, integrated with a foundational understanding of the biomedical, socio-behavioral, and clinical sciences. For these reasons, they can teach students how to provide optimal medication therapy management and help identify patient-specific drug-related problems [9]. With an expanded scope of practice, including more direct patient care responsibilities, clinical pharmacists can help ensure students have a thorough understanding of the basic sciences (i.e., mechanism of action, adverse effects, monitoring parameters). They can also help medical students develop the skills necessary to become proficient prescribers [6]. Essentially, pharmacists may play a very important role in making sure our medical students have a solid foundation of clinical pharmacology and therapeutics, in order to develop optimal prescribing skills and provide the highest quality patient care [10].

One area in which clinical pharmacists can play a significant role is curriculum integration. In the traditional medical school curriculum, basic science courses are taught first, followed by the clinical courses and clerkships. Many medical schools are moving to a curriculum in which the basic and clinical sciences are integrated, through the use of clinical scenarios with standardized patients or through the use of problem-based learning [11]. Medical students have difficulty with the transition from theoretical to clinical education. For example, it has been shown that simply presenting students with a link between a medication and an associated clinical condition is inadequate and will not help students truly understand the complex processes involved in writing appropriate prescriptions. It is thought that early exposure to life-like situations will provide students with immediate opportunities to connect the basic sciences with clinical sciences and increase student learning retention and clinical reasoning skills [11]. Clinical pharmacists can play a key role in vertical integration to help facilitate smooth transition from classroom learning to clinical education [12].

An in-depth knowledge of pharmacotherapy and real-life experiences give clinical pharmacists the ability to help with curriculum integration in many ways. They can provide detailed answers to pharmacotherapy questions and help students tie treatment recommendations into pragmatic

translation for discharge readiness and outpatient prescription filling. They can also write authentic patient case scenarios that review pharmacotherapy-related topics and clinical application questions which clearly illustrate significant medication-related issues. Their extensive knowledge may make them a great choice to collaborate on the development of cases for problem-based learning (PBL), team-based learning (TBL), or simulated or standardized patients [13]. For example, Karpa and Whaley stated that it was useful to have a clinical pharmacist included as a team-based learning facilitator during their TBL on teaching first-order pharmacokinetics, since clinical pharmacy-related questions often arise [14].

Hospital-based clinical pharmacists are a great source for pharmaceutical education while students are learning in the acute hospital setting during their clerkship years. At the University of Missouri-Kansas School of Medicine, clinical pharmacists have the sole responsibility of providing instruction in basic pharmacology and pharmacokinetics. The teaching is done in a true patient care environment, in which the understanding of pharmacotherapy can be enhanced and reinforced after reviewing therapeutic problems encountered by their patients [15]. Often times, hospital pharmacists attend rounds with the medical team, where they provide interventions to optimize medication regimens, prevent adverse drug events, and identify potential downsides to using specific classes of medication based on comorbid conditions. They also help identify barriers to medication adherence. If medical students are able to attend rounds with pharmacists during their clerkship years, they will be given the opportunity to observe and learn from pharmacist interventions, which may help them gain the knowledge and confidence necessary to

choosing an appropriate medication regimen. Clinical pharmacists can be an important factor in making sure students are capable of appropriately evaluating the risks and benefits when prescribing different medications in a real-life setting. They can teach proper monitoring strategies for increased patient safety, provide instruction on safe medication prescribing practices, and provide education on the required components on a prescription [16].

Student assessment and evaluations are other areas in which pharmacists can be significant assets. It has been stated that the assessment of medical students 'pharmaceutical knowledge needs improvement. For example, Urrutia- Aguilar and colleagues suggested that stronger assessments are necessary for pharmacology education, since positive student ratings for teacher effectiveness did not correlate with good objective exam scores [17]. O'Shaughnessy and col- leagues also stated that most schools do not assess the performance of their graduates as prescribers and that there is a lack of evidence about the effectiveness of many of the methods used to teach prescribing skills today, in which validated real- world assessments are needed [3]. One example of an evaluation that needs significant improvement is a student's pharmaceutical knowledge for appropriate prescription writing. It is known that many new physicians feel unprepared for their prescribing role [10]. In a study on undergraduate preparation for prescribing, both medical students and recent graduates felt that the amount of teaching in pharmacology, therapeutics, and prescribing was either "too little" or "far too little." Of the same students, 42% disagreed or tended to dis- agree when asked if they felt confident that their training would enable them to achieve the prescribing competencies set by the General Medical Council [18].

Communication and working relationships between physicians and pharmacists have often been cited as barriers to good interprofessional relationships. There are many reasons for this, including the role of receptionists as a "gatekeeper." Physicians may be unaware of the training of pharmacists and may perceive pharmacists as a threat to their autonomy and control [7]. The use of pharmacists early in the medical school curriculum may help enhance and foster the development of interprofessional relationships between these two professions. In healthcare, multidisciplinary teams are now considered "best practice" for providing high-quality care. On multi- disciplinary teams, many different healthcare professionals, such as physicians, nurses, and pharmacists, work together in order to provide appropriate treatment recommendations to best meet the patients 'needs. It is thought that pharmacist involvement in medical education could help encourage a cultural change towards this multidisciplinary approach, in which an early introduction to inter- professional learning may allow for an increased under- standing of the importance of pharmacists and better professional relationships [10]. New physicians may feel more comfortable asking pharmacists for help solving var- ious medication-related issues if they have a clear under- standing of their role in the provision of healthcare. In the end, this could be a great way to improve patient outcomes.

Although clinical pharmacists will not solve all issues re- lated to pharmacology education, they can be an

important asset in improving pharmacology instruction and assessment. Clinical pharmacists can and should play an important role in enhancing the curriculum by improving pharmacotherapy education, as they can share their pharmaceutical knowledge and help medical students apply that knowledge to real-life scenarios. The expertise that pharmacists have in all areas of drug therapy gives them the ability to help create more effective active learning strategies and assessments for pharmacology- related topics. Through interprofessional education by clinical pharmacists, medical students can gain confidence in their pharmaceutical knowledge and succeed in their future prescribing role.

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