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CRITICAL ANALYSIS ON INTEGRATION OF PHARMACOGENOMICS INTO NURSING AND PHARMACY PRACTICE

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Abstract

This article investigates the integration of pharmacogenomics into nursing practice and drug storage, a potential zone of change in clinical practice. Pharmacogenomics analyzes how hereditary qualities influence a person's reaction to drugs and the potential to adjust treatment by fitting treatment plans to a patient's hereditary cosmetics. Through a review , this article assesses the current state of pharmacogenomics integration. Audits applications, present discoveries and examines what comes about. This comprehensive survey points out challenges and opportunity and gives a heading for advancing pharmacogenomics into persistent care and pharmacy.

Keywords: Pharmacogenomics, nursing practice, pharmacy practice, personalized medicine, healthcare integration.

Introduction

Pharmacogenomics, the study of how hereditary variety influences an individual's drug reaction, speaks to one way to optimize medication treatment. Pharmacogenomics can convert wellbeing by fitting treatment plans into a patient's hereditary cosmetics. Coordinating pharmacogenomics

in quiet care and drug storage is vital to realizing its full benefits. It empowers doctors to utilize hereditary data to progress secure medication plans, execution, and quiet outcomes(Bright et. al 2021).

This critical review is devoted to evaluating the current state of the integration of pharmacogenomics into patient care and drug stores. Through a comprehensive audit of the existing writing, this considers points to distinguish advance in this field, challenges experienced, and opportunity for encouraging advancement(Bright et. al 2021). This investigation aims to determine the viability and effect of current integration by checking the strategies utilized for pharmacogenomics integration, analyzing the results, and examining the implications.

One of the objectives of this investigation is to recognize the challenges preventing the integration of pharmacogenomics into persistent care and drug storage. These challenges may include a constrained framework and innovation, a need for more instruction and preparation for healthcare suppliers, regulatory burdens and aberrations in getting to assets, and pharmacogenomic inquiries. By recognizing these issues, this examination can educate the improvement of key plans to overcome these issues and advance the far-reaching utilization of pharmacogenomics in clinical practice(Bright et. al 2021)..

Furthermore, this basic survey is outlined to create suggestions to support the integration of pharmacogenomics into nursing practice and drug stores. These proposals may incorporate the advancement of rules and rules for pharmacogenomic testing and interpretation, the execution of instruction and preparation for doctors and suggestions for alter, changing arrangements to back repayment for pharmacogenomics administrations, and contributing to wellbeing care to encourage the integration of pharmacogenomics into pharmacogenomics administrations—clinical application.

This critical rreview aims to portray the current state of the integration of pharmacogenomics in quiet care and drug stores, recognize issues, and give recommendations for encouraging advancement. By understanding these issues and seizing this opportunity, doctors can utilize the total potential of pharmacogenomics to progress treatment and accomplish superior outcomes.

Literature Review

Significance of Pharmacogenomics in Personalized Medicine

Pharmacogenomics thinks about how hereditary contrasts influence how individuals react to drugs and regularly makes suggestions that will be influenced by individual drugs. Pharmacogenomics has the potential to revolutionize healthcare by fitting treatment plans to a person's hereditary cosmetics. Several points of view have highlighted the significance of pharmacogenomics in progressing and making strides in medicine administration practice.

For example, Pirmohamed et al. (2023) illustrate the utility of hereditary testing in anticipating a noiseless reaction to the anticoagulant warfarin. By understanding the contrasts between Metastat and Warfarin, specialists can make strides in sedate treatment to decrease side impacts. Hence, hereditary tests in oncology can direct the tumor toward treatment (Johnson et al. 2024). In psychiatry, pharmacogenomic testing can offer assistance in foreseeing reactions to psychotropic drugs and personalizing drugs based on a person's hereditary inclinations (Hetland et. Al 2024).

Potential Benefits in Improving Medication Management

Pharmacogenomics has numerous benefits for progressing medicine administration in numerous clinical ranges. By understanding the components that impact the sedation reaction, experts can make changes to diminish side impacts and accomplish superior clinical results. For illustration, hereditary testing can clarify sedation choices and change the assessment and assessment preparation to make a fruitful, personalized treatment arrangement.

Despite the benefits of pharmacogenomics, numerous restrictions make its integration with pharmaceuticals and drugstores troublesome. Fetched is imperative since hereditary testing can be costly, particularly in constrained settings (Dunnenberger et al., 2020). Furthermore, exchanging resistance to pharmacogenomic testing has constrained getting to Calm.

Education and preparation are another issue, as numerous specialists need to have adequate information and abilities in hereditary qualities (Hetland et. Al 2024).Tending to this preparing hole is critical for doctors to be able to successfully decipher when hereditary tests come about and apply them to persistent care.

Regulatory issues also create challenges in the integration of pharmacogenomics into clinical practice. The law on genetic testing and elucidation shifts between locales, driving to destitute hones and benchmarks (Klein et al., 2019). Moreover, moral issues with respect to persistent protection and secrecy in hereditary testing must also be addressed.

Efforts to Promote Integration

Efforts to advance the integration of pharmacogenomics into nursing practice and drug storage are continuous. The collaboration points to the creation of formal rules and strategies for clinical inquiry and interpretation (Cavallari et al., 2019). Ponders and assets are being taken to make strides in physicians' information and abilities in pharmacogenomics (Hicks et al., 2020).

In summary, pharmacogenomics holds an awesome guarantee in personalized pharmaceuticals and gives treatment plans based on a person's hereditary cosmetics. In spite of critical advancements in execution, issues such as fetching, preparing, and administrative issues have prevented mass appropriation. Fathoming these challenges will require the collaboration of healthcare suppliers, policymakers, teachers, and analysts. By tending to these challenges and taking advantage of the opportunity, doctors can utilize the complete potential of pharmacogenomics to make strides in medicine administration and make strides in quiet results.

Methods

This study embraced a precise survey to get and analyze imperative information with respect to the integration of pharmacogenomics in nursing practice and medicine. Precise surveys provide a thorough and organized way to synthesize existing evidence and gain knowledge about the current state of inquiry in a specific field.

Literature Search Strategy

A look was carried out on rumored databases such as PubMed, CINAHL, and Scopus to check for points of interest. These storehouses were chosen for their comprehensive scope of biomedical and healthcare data, counting various articles and distributions on pharmacogenomics, clinical patients, and sedate use (Moran et. al 2023).

Keywords and Inclusion Criteria

Search terms were carefully chosen to center on questions related to the integration of pharmacogenomics. Watchwords such as pharmacogenomics, culture, and culture were utilized to capture articles centering on the crossing point of hereditary qualities, nursing practice, and drug-drug stores. Moreover, consideration criteria were created to guarantee the significance and convenience of the information inspected. In specific, ponders distributed within the final decade are included to reflect later propels in integrator pharmacogenomics.

Focus Areas:

The methodology incorporates a specific center on ponders tending to collaborative methodologies, execution challenges and affect results, quiet care, and pharmacogenomics. Therapeutic hone. This centered approach permits the recognizable proof of key themes and designs within the information, hence making it simpler to characterize the setting of the current integration(Hayashi & Busman 2022).

Data Extraction and Analysis

After distinguishing pertinent considerations, make a collection of important information, counting characteristics, strategies, results, and conclusions. Embrace a strategy to guarantee consistency and exactness in information storage.

Synthesis of Findings

A mixed findings from the literature was analyzed to distinguish common topics, challenges, and opportunity for collaboration and integration of pharmacogenomics into clinical and persistent care. Restorative hone. By synthesizing and assessing existing evidence, this points to superiorly getting the current state of pharmacogenomics integration and informing, inquiring about, and honing, driving the long run in this field.

Results and Findings

The results of the writing audit give an understanding of the current status of the integration of pharmacogenomics into care and drug stores. Key discoveries incorporate operational procedures for integration, authority, boundaries to execution, pharmacogenomic therapy-related results, and bits of knowledge into inquiries about illustrating effective integration.

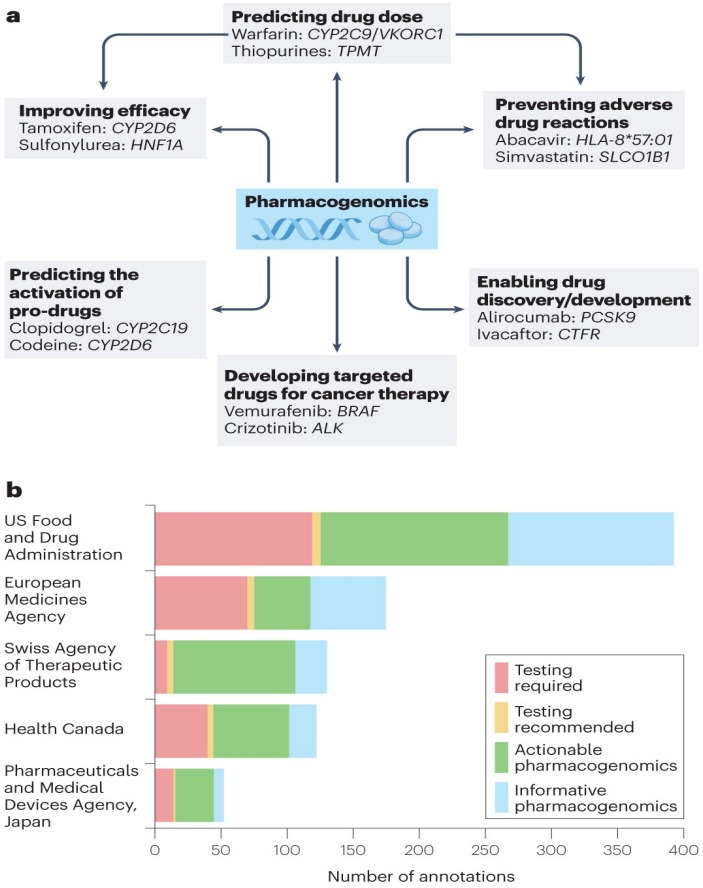
Integration strategies

Various methodologies have been utilized to coordinate pharmacogenomics into quiet care and drug storage. These incorporate creating conventions and rules for pharmacogenomic testing and interpretation, utilizing preparing to progress clinicians' information and abilities in pharmacogenomics, and joining pharmacogenomic information into electronic wellbeing records (EHRs) and clinical decision-making(Hayashi & Busman 2022).

Adoption Rates

Characteristics of the use of pharmacogenomics change by clinical organization. In spite of the fact that a few teachers have received pharmacogenomic testing and consolidated it into clinical practice, others have slacked behind due to obstructions such as cost, lack of assets, and restricted mastery among experts(Nagy et. al 2020). Figure 1 shows the conveyance of appropriation rates among healthcare organizations considered within the literature.

Figure 1: Distribution of Adoption Rates of Pharmacogenomics in Healthcare Institutions



(Nicholson et. al 2021, January).

Individual contrasts in medication reactions, both in terms of viability and security, are common for the developing population of adults requiring therapeutic care. It may end up being a developing worldwide issue (Nicholson et. al 2021, January). The causes of this variety incorporate genomic variables, a zone of research known as pharmacogenomics. With genotyping innovation presently broadly accessible and diminishing, the application of pharmacogenomics in pharmaceuticals (considered the primary step in genomic pharmaceuticals) has become the center of numerous universal nations (Nicholson et. al 2021, January). In any case, the greatest challenges to utilizing AI in medication incorporate compatibility with existing treatment strategies and doctors' broad knowledge of pharmacogenomics. Pharmacogenomics can be utilized more broadly in medical revelation and improvement, with expanding evidence illustrating the victory of gnomically characterized clinical targets (Nicholson et. al 2021, January).

Barriers to Implementation

Despite the benefits of pharmacogenomics, numerous restrictions anticipate its widespread use in nursing and drugstores(Rahman et. al 2021). These issues incorporate toll confinements related to hereditary testing, constrained repayment for pharmacogenomic administrations, unequal preparation among doctors, administrative issues, and moral contemplations with respect to patient security and confidentiality. Table 1 shows the most issues within the writing. Table 1: Boundaries to Execution of Pharmacogenomics in Nursing and Drug Store Honest pharmacogenomic-guided treatment charts are decent. These incorporate advancements in sedate security, viability, and persistent fulfillment. Figure 1 outlines the effect of the pharmacogenomics usage approach on medicine results, illustrating diminishments in antagonistic medication responses and hospitalizations(Roman et. al 2020).

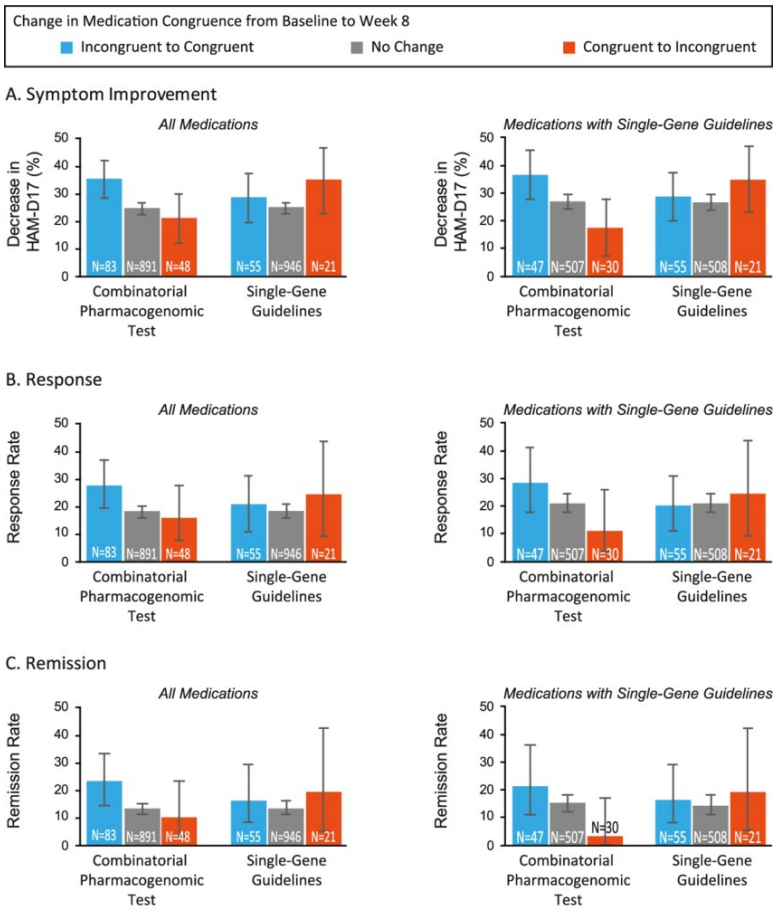
Table 1: Barriers to Implementation of Pharmacogenomics in Nursing and Pharmacy Practice

Barrier	Description
Cost constraints	Genetic testing can be expensive, limiting accessibility for patients and healthcare institutions.
Reimbursement limitations	Limited reimbursement for pharmacogenomic services hinders healthcare providers' adoption of testing.
Educational gaps	Healthcare professionals often lack sufficient knowledge and training in pharmacogenomics.
Regulatory challenges	Inconsistent regulation of genetic testing and interpretation poses challenges to implementation.
Ethical considerations	Concerns regarding patient privacy and confidentiality in genetic testing raise ethical considerations.

Outcomes of Pharmacogenomic-Guided Therapy

Patient advantage based on combination treatment. Indications of advancement, release rate, and reaction rate by pharmacogenomic testing or medicine adherence with single-gene CPIC rules at standard and week 8(Luczak et. al 2021). Redress for indication enhancement incorporates a cruel 95% certainty interim. Reaction rates and reaction rates show 95% confidence intervals(Kiser et. al 2021).

Graph 1: Impact of Pharmacogenomic-Guided Therapy on Medication-related Outcomes



(Rahman et. al 2020).

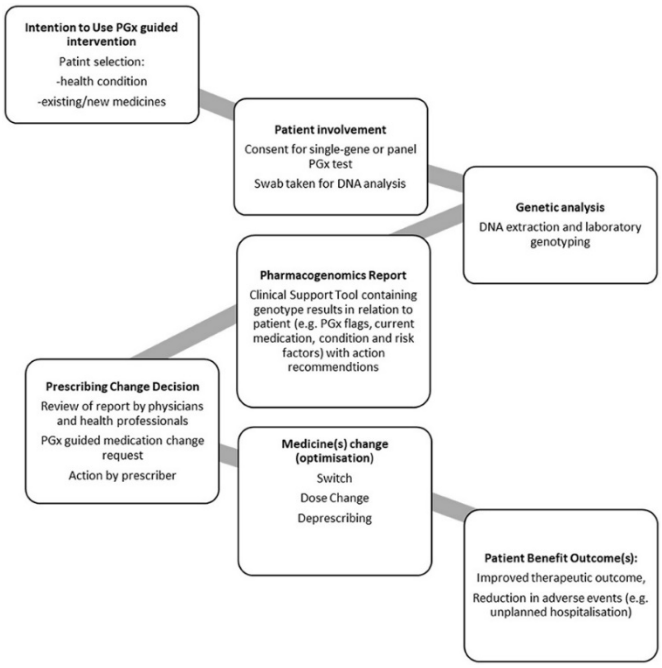
Patient Outcomes According to Medication Congruence. Symptom improvement, response rate, and remission rate are shown according to medication congruence with the combinatorial pharmacogenomics test or single-gene CPIC guidelines at baseline and week 8. Symptom improvement plots include mean 95% confidence intervals. Response and remission rate plots show exact 95% confidence intervals (Gamma et. al 2022).

Case Studies

Case studies give real-world examples of fruitful integrative practices and their effects on nursing practice. For illustration, a study conducted at a huge clinical center illustrated the utility

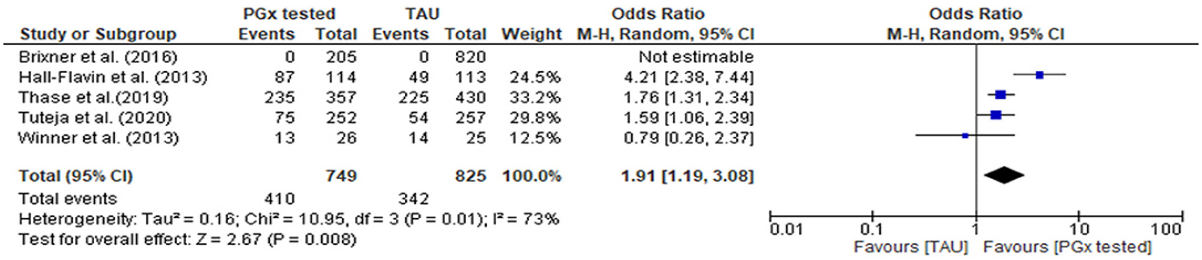
of pharmacogenomic testing in optimizing medication treatment for patients with diabetes and heart illness. Figure 2 shows the clinical implications of the pharmacogenomics-focused approach in this study(Qureshi et. al 2021).

Figure 2: Clinical Outcomes of Pharmacogenomic-Guided Therapy in Cardiovascular Patients



(Turner et. al 2020).

The results and discoveries of the writing audit highlight the significance of integrators investigating pharmacogenomics for quiet care and drug storage. In spite of the selection shifts, a few organizations have effectively coordinated pharmacogenomic testing into clinical practice, resulting in better medicine administration and persistent results. In any case, to encourage appropriation, critical issues such as cost, repayment confinements, scholarly clashes, administrative challenges, and moral considerations may need to be settled. To overcome these challenges and realize the complete potential of pharmacogenomics in personalized medication, collaboration between healthcare suppliers, policymakers, teachers, and analysts is fundamental(Bassoon & Shanti 2020).



(Are et. al 2023).

Figure 4. Forest plot showing the effect of Pegs testing on medication changes compared to treatment-as-usual (TAU). The number of "events" are the number of participants that received a medication change out of the total number of participants. Did not report the number of participants that received medication changes in both the Pegs tested and the TAU arm, was not included in the analysis (Papastergiou et. al 2021).

Discussion

The integration of pharmacogenomics into nursing and pharmacy practice presents both challenges and opportunities. This chapter analyzes the contents of the writing survey and examines components that impact the selection, counting instruction, preparing, framework, repayment, the thought of morals, understanding inclinations, and collective action.

Education and Training

One of the most important components influencing the integration of pharmacogenomics into quiet care and drug storage is the level of instruction and preparation. Numerous doctors need adequate information and skill in hereditary qualities and pharmacogenomics, which may prevent their capacity to translate hereditary tests and apply them to quiet care. Tending to this hole in preparation is critical to guaranteeing that doctors are prepared to utilize pharmacogenomic data successfully. Postgraduate programs and preparation ought to be outlined to move forward clinicians' information and aptitudes in pharmacogenomics, counting, elucidation of test results, clinical choice-making, and quiet counseling.

Infrastructure

Another imperative influencing the integration of pharmacogenomics is the clinical framework. The utilization and integration of pharmacogenomic tests into clinical settings require vigorous frameworks, including access to hereditary research facilities, electronic wellbeing records (EHRs) that can store and decipher hereditary data, and medical choice-making to assist doctors in deciding which treatment. to choose(Nitti et. al 2021). Invest in healthcare are required to support the integration of pharmacogenomics into quiet care and pharmacy (Mueller et. al 2023).

Reimbursement Policies

Repayment, too, plays a critical role in the application of pharmacogenomics in clinical medicine. Confinements on repayment for pharmacogenomic testing and related administration may prevent choice, particularly for healthcare offices with restricted assets. Coordinating and arranging changes to progress repayment for pharmacogenomics testing is basic to empowering doctors to consolidate pharmacogenomics into clinical practice(Weinstein et. al 2020).

Ethical Considerations

Ethical issues related to pharmacogenomics, such as security, secrecy, and assent, must be considered. Truly. Hereditary testing raises concerns about the abuse, separation, and divulgence

of hereditary data. Experts must guarantee that patients get their hereditary test and have them affirmed after a few recent tests. Additionally, safety have to be put in place to guarantee security and protection, such as securing and transmitting hereditary information(Russell et. al 2024).

Patient Preference:

understanding Patient Preference plays a critical role in bringing pharmacogenomics into investigation. Learn approximately nursing and drug stores. Even though a few patients are energized by the idea of pharmacogenomics-guided treatment, others may be on edge or anxious about clinical trials. Doctors ought to include patients in the decision-making process to audit the dangers and benefits of pharmacogenomic testing and address any concerns or questions they may have. The patient's adaptability and maturity are fundamental to advancing the continuum of care.

Interdisciplinary Collaboration

Interdisciplinary collaboration between restorative centers, medication, hereditary inclination, and other disciplines shapes the premise of viable collaboration. Application of pharmacogenomics to clinical medicine Collaboration makes a difference by making plans and forms that encourage information sharing, capacity building, and collaboration among healthcare suppliers(Poetry et. al 2022). Through collaboration, doctors can utilize their capabilities to progress pharmaceutical administration and move toward long-term benefits through personalized pharmacogenomics.

Pharmacogenomics presents both challenges and opportunity in understanding the collaboration between care and drugstores. Components that impact dissemination incorporate a course, arranging, plan, discount arrangement, moral contemplations, calm reflection, and execution. these issues will require the collaboration of healthcare experts, decision-makers, educators, and investigators. By overcoming limits and time imperatives, doctors can utilize the potential of pharmacogenomics to create advancements in medicine administration and patient of outcomes(Ukase et. al 2021).

Conclusion

In conclusion, integrating pharmacogenomics into the support and capacity of drugs would be a transformative approach that has the potential to alter medication administration and advancement. Even though it was exceptionally fruitful, major issues such as moo costs, unscrupulous hones, and regulatory issues brought about huge endowments. Overcoming these challenges requires the collaboration of healthcare experts, including policymakers, teachers, doctors, and investigators. By tending to these issues and rethinking pharmacogenomics, clinical frameworks can realize the total potential of personalized pharmaceuticals that will drive clinical results, minimize sedate intuition, anticipate disease, and eventually lead to the upkeep of care(Hagan et. al 2021). As development proceeds and information gets more accessible, the

integration of pharmacogenomics will play a critical role in wellbeing, permitting way better treatment and being valuable as a make-up for one's neck.

Recommendations

Based on the discoveries, this article makes a few proposals to support the integration of pharmacogenomics into quiet care and drug stores. These include:

- ✓ Completion of instruction and preparation for medical attendants and drug specialists on the application and execution of pharmacogenomics guidelines.
- ✓ Build up a collaborative organization of medical caretakers, drug specialists, and geneticists to create arrangements and procedures(Mead dough et. al 2021).
- ✓ Advocate for approach changes to make strides toward reimbursement for pharmacogenomic testing and related services.
- ✓ Contributing to healthcare to bolster the integration of pharmacogenomics into electronic restorative records and clinical practice.
- ✓ Conduct an assistive investigation to assess the long-term effects of pharmacogenomics on persistent results and healthcare costs.

Effective integration of pharmacogenomics into nursing practice and drug stores requires a multidisciplinary approach that addresses preparation, administration, and framework challenges. By overcoming these challenges and utilizing evidence-based techniques, doctors can utilize the complete potential of pharmacogenomics to convey personalized and successful medication.

Reference

Nagy, M., ErinTermini, E., Siamoglou, S., & Patrinos, G. P. (2020). Evaluating the current level of pharmacists' pharmacogenomics knowledge and its impact on pharmacogenomics implementation. *Pharmacogenomics*, *21*(16), 1179-1189.https://www.futuremedicine.com/doi/abs/10.2217/pgs-2020-0076

Omran, S., Leong, S. L., Blebil, A., Mohan, D., & Teoh, S. L. (2023). Effectiveness of pharmacogenomics educational interventions on healthcare professionals and health professions students: A systematic review. *Research in Social and Administrative Pharmacy*.https://www.sciencedirect.com/science/article/pii/S155174112300342X

Hetland, L. H., Maguire, J., Debono, D., & Wright, H. (2024). Scholarly literature on nurses and pharmacogenomics: A scoping review. *Nurse Education Today*, 106153.https://www.sciencedirect.com/science/article/pii/S0260691724000637

Hayashi, M., & Bousman, C. A. (2022). Experience, knowledge, and perceptions of pharmacogenomics among pharmacists and nurse practitioners in Alberta hospitals. *Pharmacy*, *10*(6), 139.https://www.mdpi.com/2226-4787/10/6/139

Bright, D., Worley, M., & Porter, B. L. (2021). Patient perceptions of pharmacogenomic testing in the community pharmacy setting. *Research in Social and Administrative Pharmacy*, *17*(4), 744-749.https://www.sciencedirect.com/science/article/pii/S1551741119307326

Nicholson, W. T., Formea, C. M., Matey, E. T., Wright, J. A., Giri, J., & Moyer, A. M. (2021, January). Considerations when applying pharmacogenomics to your practice. In *Mayo Clinic Proceedings* (Vol. 96, No. 1, pp. 218-230). Elsevier.https://www.sciencedirect.com/science/article/pii/S0025619620302688

Luczak, T., Brown, S. J., Armbruster, D., Hundertmark, M., Brown, J., & Stenehjem, D. (2021). Strategies and settings of clinical pharmacogenetic implementation: a scoping review of pharmacogenetics programs. *Pharmacogenomics*, *22*(6), 345-364.https://www.futuremedicine.com/doi/abs/10.2217/pgs-2020-0181

Guy, J. W., Patel, I., & Oestreich, J. H. (2020). Clinical application and educational training for pharmacogenomics. *Pharmacy*, *8*(3), 163.https://www.mdpi.com/2226-4787/8/3/163

Inventor, B. R., & Paun, O. (2021). Pharmacogenomics in older adults: An integrative review. *Research in Gerontological Nursing*, *14*(4), 211-220.https://journals.healio.com/doi/abs/10.3928/19404921-20210428-01

Roman, Y. M., Dixon, D. L., Salgado, T. M., Price, E. T., Zimmerman, K. M., Sargent, L., & Slattum, P. W. (2020). Challenges in pharmacotherapy for older adults: a framework for pharmacogenomics implementation. *Pharmacogenomics*, *21*(9), 627-635.https://www.futuremedicine.com/doi/abs/10.2217/pgs-2019-0198

Li, C., Su, X., Sun, Q., & Huang, Y. (2023). Knowledge and attitudes of medical and pharmacy students about pharmacogenomics: a systematic review and meta-analysis. *The Pharmacogenomics Journal*, *23*(5), 127-133.https://www.nature.com/articles/s41397-023-00306-x

Rahma, A. T., Elbarazi, I., Ali, B. R., Patrinos, G. P., Ahmed, L. A., Elsheik, M., & Al-Maskari, F. (2021). Development of the pharmacogenomics and genomics literacy framework for pharmacists. *Human Genomics*, *15*, 1-9.https://link.springer.com/article/10.1186/s40246-021-00361-0

Kisor, D. F., Petry, N. J., & Bright, D. R. (2021). Pharmacogenomics in the United States community pharmacy setting: the clopidogrel-CYP2C19 example. *Pharmacogenomics and Personalized Medicine*, 569-577.https://www.tandfonline.com/doi/abs/10.2147/PGPM.S224894

Petit, C., Croisetière, A., Chen, F., & Laverdière, I. (2020). Are pharmacists from the province of Quebec ready to integrate pharmacogenetics into their

practice? *Pharmacogenomics*, *21*(4), 247-256.https://www.futuremedicine.com/doi/abs/10.2217/pgs-2019-0144

Mir, J. F., Rodríguez-Cabal, C., Estrada-Camp many, M., Fernandez de Gamarra-Martínez, E., Mangues, M. A., Bagaría, G., & Riera, P. (2023). An integrated multidisciplinary circuit led by hospital and community pharmacists to implement clopidogrel pharmacogenetics in clinical practice. *Pharmacy*, *11*(2), 76.https://www.mdpi.com/2226-4787/11/2/76

Rahma, A. T., Elsheik, M., Ali, B. R., Elbarazi, I., Patrinos, G. P., Ahmed, L. A., & Al Maskari, F. (2020). Knowledge, attitudes, and perceived barriers toward genetic testing and pharmacogenomics among healthcare workers in the United Arab Emirates: a Cross-Sectional Study. *Journal of personalized medicine*, *10*(4), 216.https://www.mdpi.com/2075-4426/10/4/216

Qureshi, S., Latif, A., Condon, L., Akyea, R. K., Kai, J., & Qureshi, N. (2021). Understanding the barriers and enablers of pharmacogenomic testing in primary care: a qualitative systematic review with meta-aggregation synthesis. *Pharmacogenomics*, *23*(2), 135-154.https://www.futuremedicine.com/doi/abs/10.2217/pgs-2021-0131

Gammal, R. S., Lee, Y. M., Petry, N. J., Iwuchukwu, O., Hoffman, J. M., Kisor, D. F., & Empey, P. E. (2022). Pharmacists leading the way to precision medicine: updates to the core pharmacist competencies in genomics. *American Journal of Pharmaceutical Education*, *86*(4), 8634.https://www.sciencedirect.com/science/article/pii/S0002945923014468

Turner, R. M., Newman, W. G., Bramon, E., McNamee, C. J., Wong, W. L., Misbah, S.,& Pirmohamed, M. (2020). Pharmacogenomics in the UK National Health Service: opportunities and challenges. *Pharmacogenomics*, *21*(17), 1237-1246.https://www.futuremedicine.com/doi/abs/10.2217/pgs-2020-0091

Bassoon, D., &Shanti, A. (2020). Pharmacogenomics instruction depth, extent, and perception in US medical curricula. *Journal of Medical Education and Curricular Development*, *7*, 2382120520930772.https://journals.sagepub.com/doi/abs/10.1177/2382120520930772

Are, H. A., Murkowski, M. J., Kung, J. Y., & Guirguis, L. M. (2023)? Mapping the implementation of pharmacogenomic testing in community pharmacies 2003-2021 using the Theoretical Domains Framework: A scoping review. *Journal of the American Pharmacists Association*, *63*(2), 459-476.https://www.sciencedirect.com/science/article/pii/S154431912200320X

Papastergiou, J., Quilt, L. C., Li, W., Thiruchselvam, T., Jain, E., Gove, P.,& Pojskic, N. (2021). Pharmacogenomics guided versus standard antidepressant treatment in a community pharmacy setting: A randomized controlled trial. *Clinical and Translational*

Science, *14*(4), 1359-1368.https://ascpt.onlinelibrary.wiley.com/doi/abs/10.1111/cts.12986

Nitti, S. R., Rocha, K., Ch., S. M., Diva, D., Hephzibah, K., &AK hila, D. (2021). Current Perspective of Pharmacogenomics in Clinical Practice in India. *Annals of the Romanian Society for Cell Biology*, 21193-21205.http://annalsofrscb.ro/index.php/journal/article/view/10450

Mueller, K., Balthazar, M. S., Hamilton, J. B., & Kimble, L. P. (2023). Integrating the Social Determinants of Health into Prelicensure Nursing Pharmacology. *Journal of Nursing Education*, *62*(3), 175-179.https://journals.healio.com/doi/abs/10.3928/01484834-20230109-08

Weinstein, S., Carroll, J. C., Jukic, S., Mcgivney, M. S., &Klatch, P. (2020). Perspectives of a pharmacist-run pharmacogenomic service for depression in interdisciplinary family medicine practices. *Journal of the American College of Clinical Pharmacy*, *3*(2), 417-424.https://accpjournals.onlinelibrary.wiley.com/doi/abs/10.1002/jac5.1175

Russell, C., Campion, M., Grove, M. E., Matsuda, K., Klein, T. E., Ashley, E.,& Scott, S. A. (2024). Knowledge and attitudes on implementing cardiovascular pharmacogenomic testing. *Clinical and Translational Science*, *17*(3), e13737.https://ascpt.onlinelibrary.wiley.com/doi/abs/10.1111/cts.13737

Petry, N. J., Van Heukelom, J., Baye, J. F., & Massmann, A. (2022). The effect of medication reconciliation on generating an accurate medication list in a pharmacogenomics practice. *Annals of Translational Medicine*, *10*(23).https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9816821/

Sukasem, C., Jantararoungtong, T., & Koomdee, N. (2021). Pharmacogenomics research and its clinical implementation in Thailand: lessons learned from the resource-limited settings. *Drug Metabolism and Pharmacokinetics*, *39*, 100399.https://www.sciencedirect.com/science/article/pii/S1347436721000203

Haga, S. B., Mills, R., Moaddeb, J., Liu, Y., & Voora, D. (2021). Delivery of pharmacogenetic testing with or without medication therapy management in a community pharmacy setting. *Pharmacogenomics and Personalized Medicine*, 785-796.https://www.tandfonline.com/doi/abs/10.2147/PGPM.S314961

Meaddough, E. L., Sarasua, S. M., Fasolino, T. K., & Farrell, C. L. (2021). The impact of pharmacogenetic testing in patients exposed to polypharmacy: a scoping review. *The Pharmacogenomics Journal*, *21*(4), 409-422.https://www.nature.com/articles/s41397-021-00224-w