

Scientific Session on Thursday, November 14th*

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ABSTRACT

The scientific session encompassed a range of topics centred around the application of technology to advance healthcare and medical education.

David Naguib's presentation explored the potential and challenges of using artificial intelligence (AI) in electronic health record-(EHR-)based pharmacovigilance in Germany and Egypt to improve adverse drug reactions (ADR) detection.

Mariam Barseghyan and colleagues discussed a digital intervention using the IConnecta't App to address the psychological impact of breast cancer and premature menopause.

Tatul Saghatelian and colleagues presented the successful pilot implementation of a mobile mammographic screening program in Armenia, highlighting its IT infrastructure and impact on early detection.

Arman Darbinyan and colleagues detailed the use of deep learning for automatic electrocardiography (ECG) and mammography analysis to detect cardiovascular diseases and cancer.

Arsen Arakelyan introduced the Armenian Genome Project as a pathway to personalized medicine, focusing on characterizing the Armenian genome and its implications for health.

Finally, Ozar Mintser's presentation addressed AI-powered learning technologies and the knowledge tracing problem in medical education, advocating for proactive educational strategies.

Overall, the session showcased diverse applications of AI and digital platforms in screening, diagnosis, monitoring, and education across different medical fields and geographical contexts.

KEYWORDS

Artificial intelligence (AI), digital healthcare platforms, diagnosis, education

**Scientific Session. Hosts: Fara Fernandes (DIT, Germany) & Prof. Martin Gerdes (UiA, Norway). Speakers: David Naguib (DIT, Egypt), Mariam Barseghyan (UB, Spain), Dr. Tatul Saghatelian (RAU/AADH, Armenia), Prof. Arman Darbinyan (RAU, Armenia), Prof. Arsen Arakelyan (RAU, Armenia), Prof. Ozar P. Mintser (NHI, Ukraine).*

1. Introduction

The Scientific Session of the DigiHealthDayS-2024 Scientific Congress took place on Thursday, November 14th in Pfarrkirchen, Germany. The overall theme was “Global Digital Health – today, tomorrow, and beyond”.

The Scientific Session included the following presentations:

- (1) “The Adoption and Use of AI in EHR-Based Pharmacovigilance; Reality, Challenges, and Potential Impact on Early Detection of ADRs in Germany and Egypt” (D. Naguib)
- (2) “Psychological Impact of Breast Cancer and Premature Menopause; Digital Intervention Approach” (M. Barseghyan, N. Belousova, V. Ziablov, M. Ruiz Romeo, A. Rodríguez- Ortega, A. Flix-Valle, C. Ochoa-Arnedo)
- (3) “Mobile Mammographic Screening Program in Armenia: IT Infrastructure and Pilot Implementation”, T. Saghatelyan, N. Manukyan, A. Avetisyan, S. Jilavyan, H. Nersoyan)
- (4) “Automatic ECG Analysis Using Deep Learning” (A. Darbinyan, S. Tigranyan, A. Asatryan)
- (5) “Armenian Genome Project: A path to personalized medicine in Armenia” (A. Arakelyan)
- (6) “Proactive and Reactive Deployment of AI-Driven Knowledge Tracing Techniques” (O. Mintser)

2. Key Considerations

The adoption and use of AI in EHR-based pharmacovigilance (PV) presents several key considerations. The reality is that both Germany and Egypt are in the early stages of adoption, facing challenges such as technical barriers, lack of resources, and data privacy concerns. The implication is that the potential for early detection of ADRs is not yet fully realized, despite a generally positive attitude among PV specialists. Addressing these barriers through education, training, secure data sharing methods, and regulatory adaptation is crucial to unlock the potential impact of AI in improving drug safety and public health.

Digital interventions for mental health, exemplified by the IConnecta't App, highlight the importance of personalized support and active patient engagement. A key consideration is the high prevalence of psychological distress, including anxiety, depression, and post-traumatic stress disorder (PTSD), among breast cancer patients experiencing premature menopause. The implication is that digital platforms offer a promising avenue for alleviating this burden by tracking symptoms, providing reliable information, and facilitating communication with healthcare professionals. Further research into the relationship between physical activity, sleep, and mental well-being, potentially through the integration of wearable devices, could significantly enhance patient care.

Mobile mammography screening programs, as implemented in Armenia, demonstrate the critical consideration of increasing accessibility to early cancer detection in remote and underserved areas. The implication is a reduction in late-stage diagnoses and improved breast cancer mortality rates, as evidenced by the Armenian program's high participation rate and detection of early-stage cancers. The success of such initiatives hinges on a robust IT infrastructure for data transmission, secure storage, and remote analysis, providing a scalable model for addressing healthcare disparities.

AI-powered medical image analysis for ECG and mammography presents a significant consideration in automating the detection of cardiovascular diseases and breast cancer. The implication is the potential for faster and more accurate diagnoses, which is particularly important given the global burden of these conditions. Key considerations include ensuring the robustness and stability of deep learning models across diverse datasets and integrating these tools effectively into clinical workflows.

The Armenian Genome Project underscores the key consideration of leveraging genomic information to advance personalized medicine. By characterizing the Armenian genome and identifying population-specific genetic variants, the project aims to understand disease risks, develop targeted diagnostics and treatments, and ultimately improve healthcare outcomes. The implication is a shift towards more precise and individualized medical interventions, with potential economic, regulatory, and educational benefits for Armenia.

AI in education and knowledge tracing highlights the crucial consideration of enhancing learning processes and ensuring the competence of healthcare professionals. Proactive education strategies, enabled by AI, aim to predict learning needs, personalize pathways, and provide timely interventions. The implication is improved knowledge retention, reduced costs in education, and better long-term results. A key challenge is the effective tracing of procedural knowledge, where virtual reality simulations offer a promising solution for assessment and feedback.

3. Future Directions

Several potential future developments and research areas emerge from the presentations. In the field of pharmacovigilance, future efforts could focus on developing and implementing specific regulations that accommodate the use of AI in ADR detection, alongside establishing robust data protection frameworks to enable the secure secondary use of EHR data for PV purposes. Further research could evaluate the effectiveness of different training programs in increasing PV specialists' knowledge and adoption of AI and EHR technologies.

Regarding digital mental health interventions, future research could explore in greater depth the relationships between physical activity levels, sleep patterns, and mental well-being in patients with breast cancer and premature menopause, potentially leveraging data from wearable devices for continuous monitoring and personalized support. The long-term efficacy and scalability of digital platforms like IConnecta't in diverse patient populations also warrant further investigation.

The success of the mobile mammography program in Armenia suggests potential for broader national implementation and adaptation of this model for other cancer screenings and healthcare services in underserved regions. Future research could focus on optimizing the IT infrastructure and workflow for such mobile screening initiatives and evaluating their cost-effectiveness and long-term impact on healthcare disparities.

In AI-powered diagnostics, future developments will likely concentrate on enhancing the robustness and generalizability of deep learning models for ECG and mammography analysis across diverse datasets and clinical settings. Research will also be needed to develop seamless integration strategies for these AI tools into existing hospital medical information systems to facilitate their adoption in clinical practice. The Armenian Genome Project lays the groundwork for extensive future research into characterizing the Armenian genome in more detail, identifying specific genetic variants associated with disease risks, and developing population-specific diagnostic tests and treatment strategies. Future efforts will likely involve integrating this genomic data with EHR systems to enable personalized medicine approaches and further understanding the genetic history and origins of the Armenian population.

Finally, in the domain of AI in education, future research will likely focus on refining proactive, AI-driven knowledge tracing methodologies to better predict student learning needs and personalize educational pathways. The development and validation of virtual reality simulations for assessing procedural knowledge represent a significant area for future work. Addressing the ethical considerations and potential biases in AI algorithms used in education will also be a crucial focus.

4. Conclusion

Overall, the presentations in this scientific session highlight the growing importance and potential of digital technologies, particularly Artificial Intelligence (AI), in various aspects of healthcare, ranging from pharmacovigilance and mental health support to disease screening, diagnostics, and medical education. A key conclusion across several presentations is that while the potential benefits are significant, the widespread adoption and effective implementation of these technologies face challenges that need to be addressed.

In the realm of pharmacovigilance in Germany and Egypt, the overarching conclusion is that AI and EHRs are underutilized, and that there is a lack of knowledge and awareness among PV specialists regarding their application. The presentations suggest a need for regulatory support, training initiatives, and the development of data protection frameworks to leverage these technologies for better ADR detection.

Regarding digital interventions, the ongoing research suggests the potential of platforms like the IConnecta't App to alleviate the psychological burden of conditions like breast cancer and premature menopause, and the value of integrating wearable technology for continuous monitoring. The mobile mammography program in Armenia provides a successful example of how accessible screening programs, enabled by mobile technology and IT infrastructure, can improve early cancer detection rates in underserved populations.

In diagnostics, the presentations on automated ECG and mammography analysis conclude that deep learning models show promising accuracy in detecting cardiovascular diseases and breast cancer, paving the way for AI-powered tools in clinical practice. The Armenian Genome Project concludes with the ambition of leveraging genomics to understand population-specific health risks and advance personalized medicine, with expected benefits across economic, regulatory, and educational sectors. Finally, the discussion on AI in education concludes that proactive, AI-driven approaches to knowledge tracing and personalized learning hold significant potential for enhancing medical education, although challenges related to bias, ethical considerations, and the definition of learning curves need to be overcome. Effective knowledge tracing is identified as crucial for the success of proactive educational strategies.

References

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| [1] Arakelyan A. Armenian Genome Project A path to personalized medicine in Armenia. DHD2024, Scientific Session. November 14, 2024. | [4] Mintser O. Proactive and Reactive Deployment of AI-driven Knowledge tracing techniques. DHD2024, Scientific Session. November 14, 2024. |
| [2] Barseghyan M, Belousova N, Ziablov V, et al. Psychological impact of breast cancer and premature menopause digital intervention approach. DHD2024, Scientific Session. November 14, 2024. | [5] Naguib D. The Adoption and Use of AI in EHR-Based Pharmacovigilance: Reality, Challenges, and Potential Impact on Early Detection of ADRs in Germany and Egypt. DHD2024, Scientific Session. November 14, 2024. |
| [3] Darbinyan A, Tigranyan S, Asatryan A. Automatic ECG Analysis Using Deep Learning. DHD2024, Scientific Session. November 14, 2024. | [6] Saghatelian T, Manukyan N, Avetisyan A, Jilavyan S, Nersoyan H. Mobile Mammographic Screening Program in Armenia: IT Infrastructure and Pilot Implementation. DHD2024, Scientific Session. November 14, 2024. |