Selected posters in E-health and technology at the 2024' Congress of the Polish Public Health Society

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Abstract

This technology poster session, presented at the VII International Congress of the Polish Public Health Society, showcased six research projects focused on contemporary challenges and advancements in public health. Topics ranged from the role of management in ensuring safety within diagnostic imaging facilities to the innovative application of artificial intelligence (AI) in specialised medical fields like trichology. The session also addressed the use of AI and digital technologies in managing public health crises (i.e. with apps), such as the COVID-19 pandemic, and explored patient- centered approaches, including the implementation of a Patient Navigation Model for cancer prevention in individuals with mental health problems. Furthermore, the session examined environmental influences on public health, specifically the impact of various factors on ozone concentration. Finally, the critical area of doctor-patient communication during the COVID-19 pandemic was analysed. The presented research highlights the importance of multidisciplinary approaches, technological innovation, and patient-centered care made feasible by participatory design, in addressing pressing public health concerns and improving healthcare outcomes.

Keywords: artificial intelligence, telemedicine, modern healthcare management, technology in healthcare, sensors

Introduction

The following posters were presented within the technology section at the VII International Congress of the Polish Public Health Society, themed "Prevention - A Great Investment in Public Health," held on November 27-28, 2024, at the MSWiA National Medical Institute, Warsaw (*) Edited by. The congress brought together leading experts, government representatives, medical institutions, and practitioners to discuss challenges and new directions in health prevention. This session brings together a diverse range of research, highlighting innovative approaches and critical analyses across various facets of the medical field. Among all presented contributions we showcased the increasing integration of technology in public health practices within Poland. A significant portion of the discussion revolved around the standardisation of medical data, particularly concerning the need for a unified approach to the implementation of the latest International Classification of Diseases (ICD-11), emphasising its potential to significantly improve the quality of health data and the management of healthcare resources or coding HPV infection data and other biomarkers in medical records. The Congress talks also highlighted Poland's transition towards a fully electronic system for the submission of cancer data. Another key theme was the application of Artificial Intelligence (AI) in healthcare (with few panels on this issue), with a particular focus on its role in combating new threats. AI is transforming healthcare (also Polish), offering opportunities to improve diagnostics, personalise treatment, and streamline administrative tasks. AI-powered tools can analyse vast datasets to identify patterns and predict patient outcomes, potentially leading to earlier and more accurate diagnoses and more effective therapies. However, concerns

remain regarding data privacy, algorithmic bias, and the potential displacement of human healthcare workers, requiring careful consideration and ethical guidelines as AI continues its integration into the medical field. Thus, the discussion on regulation (maybe over regulations in the EU?) was needed in an interdisciplinary forum such as our Congress. Courage in dark times for public health: showed the positive and negative role of the internet among others. Following this opening, the session delves into the impact of the quality of evidence on the effectiveness of prevention strategies which on the one hand technology may help in EBM but in the era of post-truth and the infodemic the AI can be used for bad and induced biological negation. One of the panel discussions was about the relationship between AI driven innovation and public health. Agnieszka Siennicka moderated the panel, and Artur Białoszewski, Andrzej Jarynowski, Łukasz Krzowski, Tomasz Maciejewski and Karolina Tądel participated as panelists delved into the ways in which advancements in technology, medicine, and policy can positively or negatively impact the health of populations. The discussion explored topics such as the role of innovation in disease prevention, military medicine (as Poland is witnessing on its border the most advanced war this century), diagnostics, and treatment, as well as the ethical, social, and economic considerations surrounding the implementation of new healthcare technologies and interventions. The six selected posters explore crucial areas including the role of management in ensuring safe working conditions in diagnostic imaging, which on one side save lives due to advances in technology, but maybe dangerous for the medical personnel We will see the promising application of AI in specialised fields like trichology, reflecting a broader trend of AI integration in healthcare (Shahid et al., 2019). The vital role of technology in combating global health crises, as seen in the COVID-19 pandemic response, a topic widely covered by the public health experts around the globe (WHO, 2023).

Furthermore, we examine patient-centered approaches, such as patient navigation in cancer prevention which is an evidence-based intervention that has proven effective in cancer care for vulnerable populations. The discussion extends to the complexities of doctor-patient communication in telemedicine (Haskard et al., 2009). Poland, especially Silesia, is known to be significantly polluted due to environmental factors influencing public health, specifically regarding air quality and ozone concentration, aligning with the research priorities of the Environmental Protection Agency (EPA, 2023).

Chapter 1: Ensuring safe working conditions in diagnostic imaging facilities – the role and responsibilities of managers

The poster was presented by Agnieszka Mierzwa, who prepared it with co-author Magdalena Syrkiewicz-Świtała.

Healthcare should ensure the safety of both patients and staff during medical procedures. Imaging diagnostics (ID) relies on advanced hardware technologies;

therefore, a modern ID manager should implement risk prevention strategies, ensuring a safe and compliant working environment as well as a secure space for providing medical services. The study utilised two methods: a survey and in-depth interviews. The survey questionnaire was directed at medical staff, while the in-depth interviews were conducted with managers of ID departments. In both cases, purposive sampling was used. The survey covered four hospital departments and six outpatient imaging diagnostic centres, with a total of 300 medical staff surveyed. The most critical factors for the proper functioning of an ID facility, as indicated by respondents, were good work organisation (71.7%), staff competence and engagement (55%), properly functioning medical equipment (45.3%), and safety during medical procedures (35.0%). A total of 74.3% of respondents believe that work organisation significantly impacts the health safety of both patients and staff during medical procedures. Moreover, 61.7% stated that the manager plays a key role in ensuring safe working conditions, while 62.0% believe that a good ID facility manager should ensure safe working conditions. The key role of the ID facility manager in ensuring the safety of working conditions and medical procedures includes: maintaining highly specialised medical equipment, adhering to safety and hygiene standards in departments, following radiological protection principles, and participating in the continuous improvement of medical staff's knowledge and skills.

Chapter 2: Artificial intelligence in trichology - usage and prospects

The poster was presented by Jolanta Pełszyńska, who prepared it with co-author Magdalena Syrkiewicz-Świtała.

This poster is aimed at prospects of use of AI technologies by trichology service providers. So far, AI has had a proven record track of use in various branches of the economy, which includes the healthcare sector. The experience of a healthcare professional embraces not only the core elements of service, such as diagnostics, evaluation and therapy. The authors of this poster have collected data in the form of research articles which describe IA applications in healthcare and trichology services. These articles provide a basis for the descriptive analysis on how AI could be applied in trichology services dividing the possible areas into: diagnostics, treatment supervision, customer contact and marketing automation. The results of research, despite their qualitative nature, present that AI is a promising technology to be used in trichology service venues (offices/clinics), which is based on the evidence of use among healthcare professionals, particularly dermatologists, whose area of expertise is near to trichology services. More importantly, trichology services can benefit from AI by its supportive effect for diagnostics, image analysis, but also by sending reminders to customers. On the side of back office processes, AI may send marketing information to the potential and actual customers, but also provide customer service. The poster shows some obvious facts on why AI should be used in trichology service venues providing the perspective of

positive outcomes for the interested service providers. There may also be some obstacles in AI used that should be considered, and the implementers should adapt to them accordingly (legal limitations, required human involvement).

Chapter 3: Artificial intelligence and its role in the fight against the COVID-19 pandemic

The poster was presented by Andrzej Staniszewski, who prepared it with co-author Jadwiga Staniszewska.

COVID-19 was a disaster that hit the globe in late 2019. In March 2020 the World Health Organization declared COVID-19 a global pandemic, as it has involved 231 countries and territories, affected more than 776.5 million people, and taken the life of 7.1 million individuals up to the end of September 2024. The COVID-19 pandemic exposed and exacerbated the existing healthcare system deficiencies. On the other hand, however, it has given a strong stimulus for the digital transformation of the entire healthcare system. Emerging technologies, including artificial intelligence (AI), machine learning (ML), deep learning (DL), and Internet of Things (IoT) have proven to be helpful to fight the COVID-19 pandemic. The purpose of this review is to explore the practical applications of AI in COVID-19, and its role in diagnosis, identification of high-risk cases, treatment planning, and limiting the spread of the pandemic. The authors have performed a literature review of publicly accessible information in scientific journals as well as news articles from April 2020 to February 2024 to identify the examples of the use of digital technologies in COVID-19.

AI is the ability of machines to exhibit human skills such as reasoning, learning, planning, and creativity - to achieve specific goals. The major applications of AI in COVID-19 disease are for early detection and diagnosis of the infection. AI can quickly analyse irregular symptoms and other 'red flags' and thus alarm the patients and the healthcare authorities. ML techniques are being used in analysing radiology images. DL (a subfield of ML) uses layers of connected artificial neurons inspired by biological neurons to mimic human decision-making processes. Training DL models generally requires very large training datasets (Big Data - i.e. sets of data that are so large and complex that they cannot be effectively stored or processed with traditional methods). The IoT collects sensor data from all manner of physical devices and makes them available on the Internet. AI can also build an intelligent platform for automatic monitoring and prediction of the spread of SARS-CoV-2 virus.

In conclusion, AI techniques have had a direct impact on supporting the process of diagnosis, estimation of epidemic trends, prognosis, and treatment of COVID-19 disease. AI has also been used for the development of effective and safe drugs and vaccines, and the reduction of workload of healthcare workers. Therefore, it has the potential to enhance the entire healthcare system efficiency during the COVID-19 pandemic.

Chapter 4: Primary Cancer Prevention for Individuals with Mental Health Problems: Steps to Implement the Patient Navigation Model in Poland through Co-Design and Participation

The poster was presented by Magdalena Kostyła, who prepared it with co-authors Magdalena Wieczorkowska and Magdalena Wrzesińska.

Patient Navigation (PN) has been well demonstrated as a potential application in the continuum of cancer care in vulnerable populations, but further research is needed to identify barriers and opportunities that may affect the implementation of PN primary cancer prevention programs for people with mental health problems. The study used a qualitative approach to tailor a navigation-based intervention in primary cancer prevention to the needs of the target population and the local context. Semi-structured interviews (with 20 participants) and 3 focus group sessions (with 12 participants) were conducted with representatives of 5 stakeholder groups. Three primary themes emerged from the interviews for analysis: barriers to accessing healthcare services, facilitators of access, and considerations for the Patient Navigation Model (PNM). Based on the key considerations for designing patient navigation presented by DeGroff et al (2014), discussions during the focus group sessions centred around 10 issues: (1) programme goals, (2) community characteristics,

(3) point(s) of intervention, (4) setting(s) of intervention (5) the range of services and navigator's responsibilities, (6) background and competencies of the navigator, (7) communication channels, (8) navigator's training, (9) navigator's supervision, and (10) evaluation measures. Involving key stakeholders in implementation research offers the opportunity to develop an intervention tailored not only to the complex needs of recipients but also to the local context and real-life settings.

Chapter 5: The influence of NOx, temperature, wind and total radiation on the level of ozone concentration in the Upper Silesian agglomeration

The poster was presented by Joanna Kobza, who prepared it with co-authors Mariusz Geremek, Mateusz Grajek, and Lechosław Dul.

Air pollution is one of the leading threats to human life, therefore it is indicated as one of the main public health concerns. Recent studies have confirmed that the high number of annual excess deaths are associated with high levels of ozone, i.e. in 2019 ozone accounted globally for about 365 000 early deaths (6.21 million years of healthy life lost) The aim of the study was to estimate the influence of NO, NO2, wind direction (WD) wind speed (WS), air temperature (TA), and total radiation (GLR) on ozone concentration levels. Data provided by 3 automatic air quality monitoring stations of the Regional Envi-

ronmental Protection Inspectorate in Katowice, were used in this study. The study showed that the strongest influencing factors for O3 values are air temperature and total radiation, with each showing a high correlation with ozone concentration. NO and NO2 had a dual effect on O3 concentration, causing an increase in ozone concentration at low NO and NO2 concentrations and a decrease in ozone concentration at higher NO and NO2 concentrations. We noted that the direction of the wind had very little effect on the concentration of O3. The influence of wind speed on the O3 level was also small, but stronger than that of the wind direction. The research shows that in the analysed years for selected measuring stations the strongest factors influencing O3 concentration are air temperature and total radiation. The NO and NO2 concentrations had a dualistic effect on the O3 concentration.

Chapter 6: Determinants of Doctor–Patient Communication in Terms of Patient Rights During the COVID-19 Pandemic

The poster was presented by Joanna Kobza, who prepared it with co-authors Kamila Jaroń, Paweł Juraszek, and Mateusz Grajek.

Today, the public does not want to be just a passive consumer of health services. Patients often expect to be informed and involved in decisions about their health. With better doctor– patient communication, patients are more likely to follow treatment recommendations. The study was conducted using a face-to-face survey method on a group of 203 adult, independent patients from 2021 to 2022 at a medical facility, i.e., a rehabilitation clinic. The purpose of this study was to assess the determinants of doctor patient communication in terms of patient rights. Patients who were active in communication (33%) wanted to ask questions or had the opportunity to ask the doctor questions, and thus, they were able to take an active part in the discussion with the doctor. By contrast, patients who were passive in communication (67%) did not want to ask questions or did not have the opportunity to ask the doctor questions. The authors' survey shows that respondents with active communication were significantly more likely than patients with passive communication (almost 100% vs. 86%) to obtain information about their condition ($p = 0.002$). Hence, the primary key element of the medical consultation is the appropriate amount and content of information given to the patient, providing explanations and answering questions. Also importantly, according to the results, active communication between patients and doctors was significantly influenced by female gender, higher education, and a positive evaluation of communication with doctors.

Conclusions

We have shown a spectrum of healthcare topics, each shedding light on the multifaceted nature of modern medicine and public health. What is a little con-

cerning is that not so much AI and Big Data applications are done in Poland (Jarynowski, et al., 2023). In events such as American Public Health Association (APHA) Annual Meeting & Expo (conference addresses a wide range of public health issues, including environmental health, health equity, and the impact of technology on public health outcomes) or European Public Health Conference: EPH (Similar to APHA, but with a European focus, covering public health challenges and research across the continent), German public health conference: DGSMP, DGEpi, DGMS and DGPH (concentrated on social medicine and modern epidemiology) there is much more AI in public health. During the congress the conclusion was formulated that EU and especially Poland is less competitive in AI in medicine than USA and is developing too slowly in relation to China and India. However, there is hope in a new generation of Polish computer scientists and health professionals, which may combine solid mathematical background with creativity and good medical intuition (Mencel, et., al 2024). AI can help in Predictive, Preventive and Personalised Medicine (Golubnitschaja, et al., 2024). Wrocław is likely to be a Polish Silicon Valley for it. An Ecosystem of innovative established companies and startups with universities focused on medtech could make Wroclaw a centre of AI research & development in biomed for the whole CEE. With selected events in 2024 such as Medtech or Techmed driven by AI and E-methodology (organised in the Spring by Wroclaw Medical University), AI in veterinary medicine (both organised in the Spring by Wrocław University of Environmental Science) Artificial Intelligence biomed (organised in the Autumn by Wrocław University), Quality in the digital future of medicine (organized in the Spring by Gromkowski Regional Specialised Hospital in Wrocław), Health Tech meetup as well Innovation in medicine and healthy lifestyle (one organised in the Spring and second in the Autumn by Wrocław University of Technology), Virtual Reality and telerehabilitation in physiotherapy (course offered by Wroclaw University of Health and Sport Sciences), made-in-wroclaw: medtech (organised in Autumn by Wrocław City Hall Office) Intelligent Rescue Systems and Civilian military Security (organised in the Spring by Academy of Land Forces in Wrocław), New Technologies in Medicine and Innovations in Telemedicine (one organised in the Winter and second in the Autumn by 4th Military Poliklinik in Wrocław), Innovation and ergonomics in geriatrics and Modern Technical Thought in Medical and Biological Sciences (both organised in the Autumn by Polish Academy of Science, Wrocław division), Dolmedtech (organised in the Autumn by Lower Silesia Marshal's Office).

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