Exploration of Digital Health Technologies

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Global innovative perspectives and trends on digital health and patient safety: highlights from the #DHPSP2024 networking event

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Abstract

Aim: This manuscript summarizes the key scientific and practical outcomes of the #DHPSP2024 digital networking event, focusing on emerging trends in digital health technologies, innovations in patient safety, and their implications for improving healthcare delivery.

Methods: The #DHPSP2024 event was held from June 18 to 20, 2024, on X (formerly Twitter) and LinkedIn, connecting professionals and stakeholders in digital health and patient safety from different sectors. Data from posts on X and LinkedIn were analyzed for geographical distribution, engagement metrics (impressions, likes, shares), top hashtags, and frequently used terms. A qualitative analysis of the central themes and key online messaging discussions of the network event was also conducted.

Results: On X, 2,329 posts by 179 participants from 38 countries generated over 231,000 impressions, with the most activity in Austria, China, and India. LinkedIn engagement included 3,475 likes, 217 comments, and 2,030 shares. Both platforms highlighted core themes such as digital health, patient safety, treatment quality, research on natural compounds, and interdisciplinary collaboration. Online messaging discussions emphasized technologies like telemedicine and artificial intelligence as critical tools for enhancing care delivery and patient safety. Participants also promoted special issues of scientific journals and explored collaborative research opportunities.

Conclusions: The #DHPSP2024 event underscored the pivotal role of digital technologies in transforming healthcare, particularly in improving the quality and safety of interventions. The findings demonstrate how digital networking events, grounded in open innovation, foster global research communities, accelerate knowledge exchange, and support the integration of clinically relevant digital solutions. The strong engagement reflects growing interest in leveraging digital platforms to advance health outcomes and professional development. Overall, the event contributed to greater visibility of ongoing research, encouraged interdisciplinary cooperation, and may positively influence both the adoption of innovations in healthcare practice and the dissemination of scientific knowledge.

Keywords

academic networking, digital health, healthcare hashtags, innovation, LinkedIn, patient safety, social media, X (formerly Twitter)

Introduction

Digital health is a rapidly growing research area, with a vast amount of evidence accumulated in recent years to better understand the mechanisms of human diseases and improve their diagnosis and treatment. Today, it is widely acknowledged that digitalization contributes and will continue to contribute significantly to solving many health challenges [1, 2]. Digital health is closely related to different fields of experimental and practical medicine, and it is of high importance for ensuring patient safety. Digitalization reduces the likelihood of errors and improves the quality of care and monitoring of patients, optimizing the processes of prevention, diagnosis, and treatment of diseases [3–8].

In particular, digital tools can improve diagnostic accuracy (for example, using AI algorithms [9]), provide continuous monitoring of patient physiological parameters through wearable devices, automate adherence control, and implement telemedicine solutions to provide access to care in remote regions. These approaches are aimed at solving systemic health problems, including a shortage of personnel, overload of institutions, an increase in chronic diseases, an aging population, etc. [2].

According to the World Health Organization (WHO) Global patient safety report (2024), unsafe health care is a major global problem affecting more than 10% of patients and causing millions of deaths, as well as significant economic losses, especially in low- and middle-income countries. Improving patient safety can significantly reduce costs and improve the cost-effectiveness of healthcare, with the potential for annual savings of up to $1.17 trillion [10].

To improve patients' safety, WHO has included the adoption of digital technologies in its Global Action Plan 2021–2030. The plan also emphasizes the implementation of open and transparent reporting systems that identify the causes of incidents, learn from mistakes, and prevent their recurrence, contributing to enhanced patient safety and healthcare efficiency. These processes are made more efficient through digital communication tools that support information exchange, accelerate the implementation of innovative solutions, and promote the spread of "open innovation" [11]. Furthermore, one of the objectives of the Global Digital Health Strategy 2020–2025 is to foster global collaboration and support the transfer of knowledge in the field of digital health [12].

Open innovations stimulate the development and implementation of new solutions in healthcare [13–15]. Thus, the creation of open digital platforms plays a crucial role in supporting innovative approaches to ensuring patient safety and the effective prevention and treatment of diseases. For example, the Digital Health and Patient Safety Platform (DHPSP) has been developed and implemented. This open innovation initiative facilitates collaborative research and the development of digital solutions to enhance patient safety [16]. Another significant example from the health sciences domain is the open innovation platform "International Natural Product Sciences Taskforce" (INPST), which brings together researchers in the field of natural product studies [17].

Within the framework of open digital medical platforms, researchers are actively using additional formats of conferences, network events with the involvement of social networks (X (Twitter), LinkedIn, etc.), and the use of hashtags, which facilitate knowledge exchange and stimulate discussions on innovative healthcare solutions [18–23]. Despite the obvious benefits of social media, its unique potential requires further study and dissemination to physicians and patients worldwide.

At the same time, online events specifically related to digital health and patient safety using social networks have not been broadly implemented up to now. In this regard, a networking event, DHPSP2024, was held from June 18 to 20, 2024, using a variation (#DHPSP2024) of the conventional hashtag (#DHPSP) of the DHPSP on the social networks X and LinkedIn. The organizers encouraged the use of the hashtag #DHPSP2024 to connect and engage digital health and patient safety professionals in expanding their professional network.

This paper offers something new in the form of a structured analysis of digital health networking activities across two of the most important social media platforms, X and LinkedIn, and understanding how professional and stakeholder communities engage and diffuse knowledge in this area. Although various other studies have addressed either one of these platforms at a time or a particular event, the added power of real-time digital engagement with cross-platform synergies in professional networking is underlined. Further, the findings go beyond the traditional academic metrics through a study of how hashtags, impressions, and qualitative themes can also be used when analyzing the virtual event for creating a global collaboration of innovation. Thus, this study aims to summarize the outcomes of the #DHPSP2024 digital networking event and systematically analyze the relevant posts that were shared in the frame of this event on X and LinkedIn. Particular attention is paid to identifying new trends in digital medical technologies, innovations in patient safety, and their impact on improving treatment efficiency.

Materials and methods

The digital networking event #DHPSP2024 was held from June 18 to 20, 2024, bringing together digital health and patient safety professionals. The organizing committee of the network event was headed by Dr. Atanas G. Atanasov. Participants were encouraged to share relevant messages through their profiles on X or LinkedIn, mentioning the hashtag #DHPSP2024, while the use of additional relevant hashtags was not discouraged. Topical issues of digital health and patient safety led to the following main proposed areas for interaction: demonstration of own research by participants; collaboration calls ("Searching for collaboration partners to do joint work on…"); jobs; announcements of special issues of journals; announcements of conferences, seminars, or lectures; linking to relevant new publications; presentation of products, services, or developed technologies; and other types of communications related to digital health or patient safety.

The event was attended by representatives of the academic community, medical specialists, digital solutions developers, representatives of the editorial board of scientific journals, and other stakeholders. Such an intersectoral composition ensured the versatility of the topics discussed and expanded the range of digital initiatives presented.

The social network X was used to extract data on posts associated with the hashtag #DHPSP2024 from March 6 to July 6, 2024. This made it possible to take into account the activity of participants before, during, and after the #DHPSP2024 event to ensure an understanding of the dynamics of participant engagement, including preparation for the event, discussions in the process, and reactions after its completion. Tweets containing this hashtag were analyzed using the Fedica (https://fedica.com/) tool as of 06.07.2024. An analysis of the geographical distribution of tweets, impressions, the most popular hashtags, and key terms was carried out. Analogic analysis of posts containing #DHPSP2024 was also done on the LinkedIn social network as of July 6, 2024. LinkedIn posts were also analyzed for the most popular hashtags and key terms.

The following steps were taken to analyze X and LinkedIn data. First, after uploading the CSV files containing the tweet or LinkedIn data, the text was processed by removing URLs and special characters and converting it to lowercase. After splitting the text into individual words, common English stop words were

excluded using the NLTK library in Python. Thereafter, the occurrences of each word were counted and hashtags from tweets or LinkedIn data posts were identified. Additionally, pairs of hashtags that frequently appeared together were analyzed in the X dataset. The fifty most frequently occurring words, hashtags, and co-occurring hashtag pairs were also identified.

In addition to the quantitative analyses described above, a qualitative content analysis was incorporated to enrich the study's analytical design. The content of #DHPSP2024 posts was reviewed to identify recurring themes and contextual details beyond word frequencies, with posts categorized according to the predefined areas of interaction (e.g., personal research sharing, collaboration calls, new technology presentations) that guided the event. Through manual examination, it became possible to connect specific digital health technologies mentioned to their relevant healthcare domains, rather than just listing them.

For instance, this process allowed a connection between discussions of telemedicine applications and the context of patient care, or a relation of mentions of AI tools to the medical fields they aim to improve. This mixed-methods approach (combining quantitative metrics with qualitative thematic analysis) provided both a broad overview of social media engagement and deeper insight into how participants framed digital health innovations in practice.

The extraction and analysis of data from X (formerly Twitter) and LinkedIn were conducted by a core team of two researchers (AGA and MEM), with two additional contributors assisting in qualitative review (OL and MM). Data processing was initiated by the lead authors, who exported content using the Fedica platform (for X) and LinkedIn analytics tools. To ensure analytical rigor, both platforms' datasets were independently reviewed by at least two researchers each. Discrepancies in coding, thematic classification, or interpretation were resolved through group discussion and consensus among the four researchers. Cross-validation of themes and metrics (e.g., top hashtags, engagement rates, word frequency) was performed to ensure consistency. The decision on which topics to report in the results was guided by relevance to digital health and patient safety, frequency of appearance, and potential scientific or practical significance. A final agreement on themes and their categorization was reached through iterative discussions among all involved authors. The key themes that emerged and are flagged in the Results and Discussion sections include: (1) telemedicine and AI in diagnostics and care, (2) digital pharmacovigilance and health sensors, (3) social media in medical education and communication, (4) digital twins and virtual platforms for care planning, and (5) patient safety initiatives and global engagement with digital health innovations.

All data is presented anonymously in compliance with the General Data Protection Regulation (GDPR), without mentioning specific accounts.

Results

An analysis of the posts using the hashtag #DHPSP2024 on the social media platform X revealed a significant level of engagement and geographic diversity among participants in the study period. A total of 2,329 posts were published by 179 participants from 38 countries, generating over 231,000 impressions.

The distribution of posts with #DHPSP2024 by the countries most actively participating in the discussion is shown in Figure 1. These findings suggest a global interest in the topic of digital health and patient safety, extending across various regions. Thus, the digital networking event #DHPSP2024 has gained widespread recognition.

Austria, China, and India took the first three positions. The high activity of participants from these countries may be due to the involvement of their researchers in organizing the event and professional activity in the field of digital health. In addition, these countries are characterized by high institutional support for the development of digital medical technologies, developed digital infrastructure, government support for digitalization, and strong academic and research clusters that contribute to the promotion of relevant initiatives.

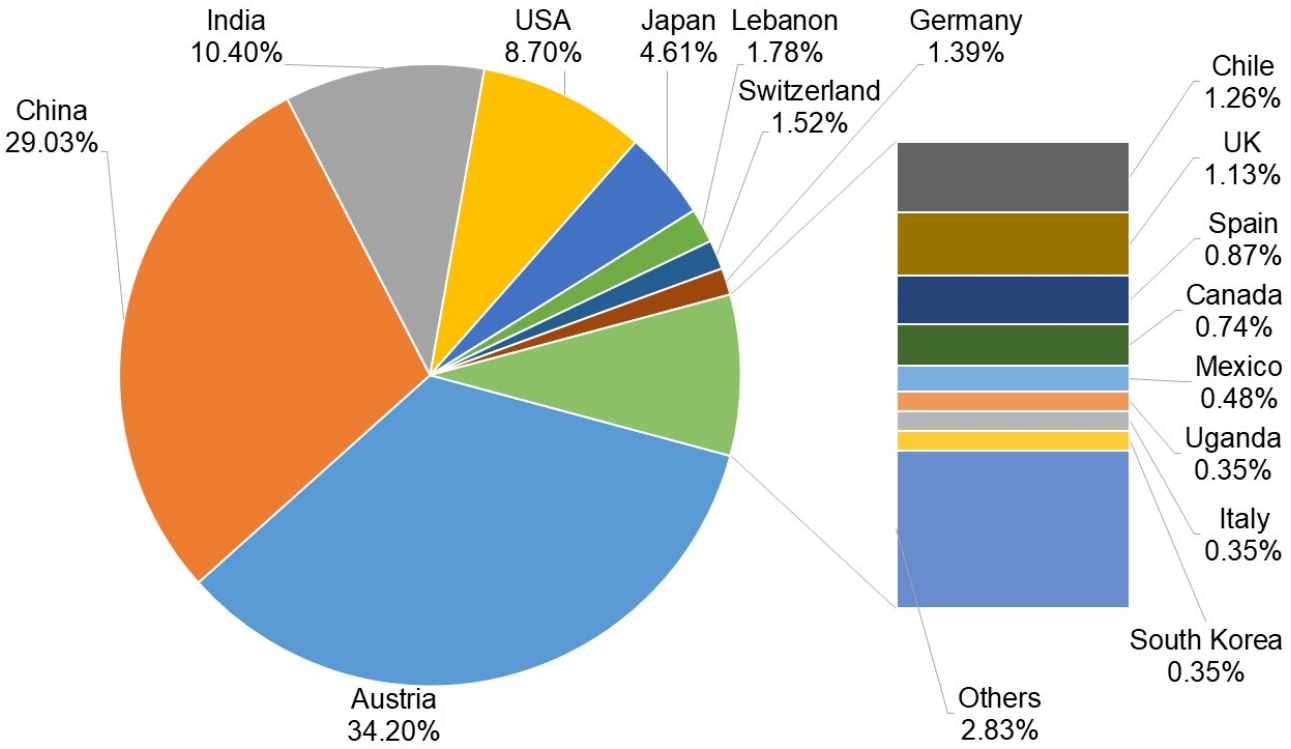

Figure 1. Distribution of X accounts participating in the #DHPSP2024 network event ranked by country.

An analysis of the time of posting activity of users of the social network X using the hashtag #DHPSP2024 revealed its peak from June 18 to June 20, 2024, coinciding with the network event.

The #DHPSP2024 online event on LinkedIn garnered 3,475 likes, 217 comments, 2,030 shares, and reached overall 5,722 engagements, demonstrating high participant activity and wide reach.

The primary objective of the conference was to bring together individuals and organizations interested in the state of modern digital health and patient safety. In connection with this, an analysis of the #DHPSP2024 posts was carried out to find the most common words and hashtags on the social networks X and LinkedIn.

X data analysis reveals the focus on digital health

The collected X data emphasizes digital health and patient safety, with frequent mentions of "digital" and "health," indicating a focus on technological advancements. "Patient" and "safety" are also prominent, highlighting discussions on care quality. Networking and research are key themes, as seen in terms like "networking," "technologies," and "research." The use of words like "share," "study," and "article" suggests a research focus and collaborative effort to improve health outcomes. Along the same line, mentions of "journal," "book," and "papers" reflect a commitment to academic contributions and knowledge dissemination (Table 1, Figure 2).

Table 1. Fifty most common words of the #DHPSP2024 posts on X.

Rank	Word	Count	Rank	Word	Count
1	digital	1,528	26	journal	142
2	health	1,506	27	book	136
3	patient	910	28	disease	132
4	safety	902	29	promote	130
5	networking	286	30	potential	130
6	healthcare	284	31	papers	128
7	technologies	276	32	AI	128
8	event	272	33	data	128

Table 1. Fifty most common words of the #DHPSP2024 posts on X. (*continued*)

Rank	Word	Count	Rank	Word	Count
9	care	256	34	cancer	126
10	review	236	35	drug	124
11	special	216	36	new	124
12	issue	214	37	global	124
13	published	204	38	glad	122
14	study	204	39	systems	118
15	future	200	40	twitter	116
16	share	196	41	sharing	110
17	analysis	188	42	intelligence	110
18	research	186	43	technology	106
19	article	178	44	role	104
20	online	168	45	views	102
21	dive	164	46	patients	100
22	June	156	47	connect	100
23	improving	152	48	collaborate	100
24	access	152	49	tools	98
25	applications	150	50	conference	98

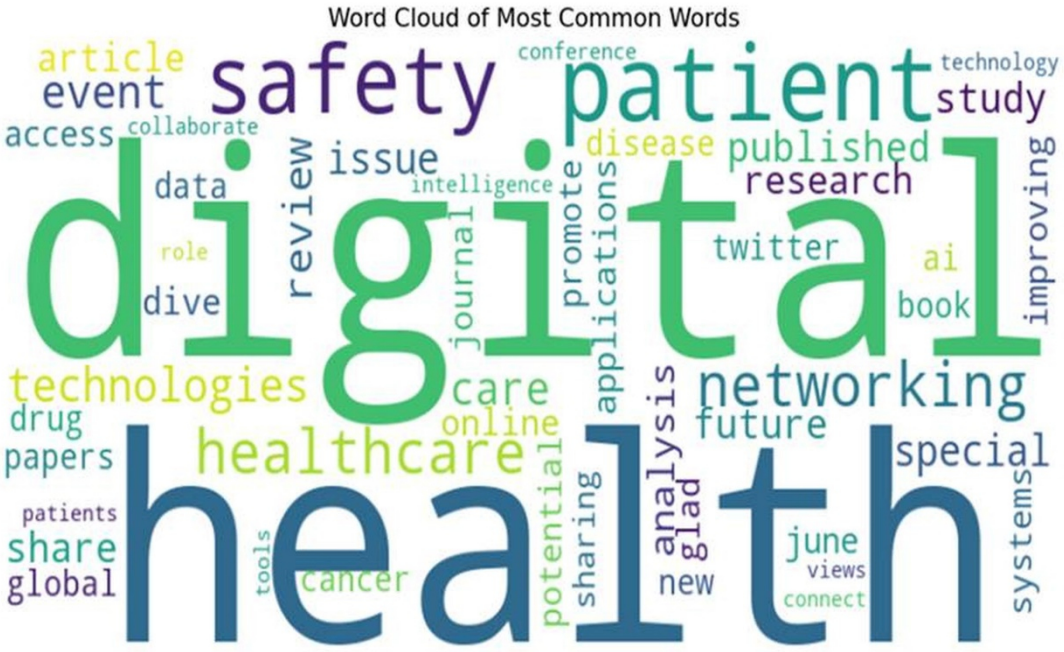

Figure 2. Word cloud of the 50 most common words revealed from the X datasets analysis of the #DHPSP2024 posts.

Analysis of the word counts from Table 1 using the Lilliefors goodness-of-fit test reveals a departure from normality, which was additionally validated by using the Q-Q plot (Figure 3). The search for extremes, Figure 4, identified values associated with the words ranked on the first four positions (digital, health, patient, safety) as statistically significant extremes that proved the principal focus of the digital networking event.

Thus, the results indicate that the networking events attracted focus on words related to academia and networking as well as digital health. Moreover, our 50 most common hashtag analysis supports the evidence that the networking event was successful in focusing on patient digital health.

The X hashtag data highlights a strong focus on digital health and patient safety, with #DHPSP2024, #DigitalHealth, and #PatientSafety leading the conversation (Table 2). The top hashtags emphasize the importance of healthcare innovations and patient well-being. Hashtags like #SciComm and #INPST

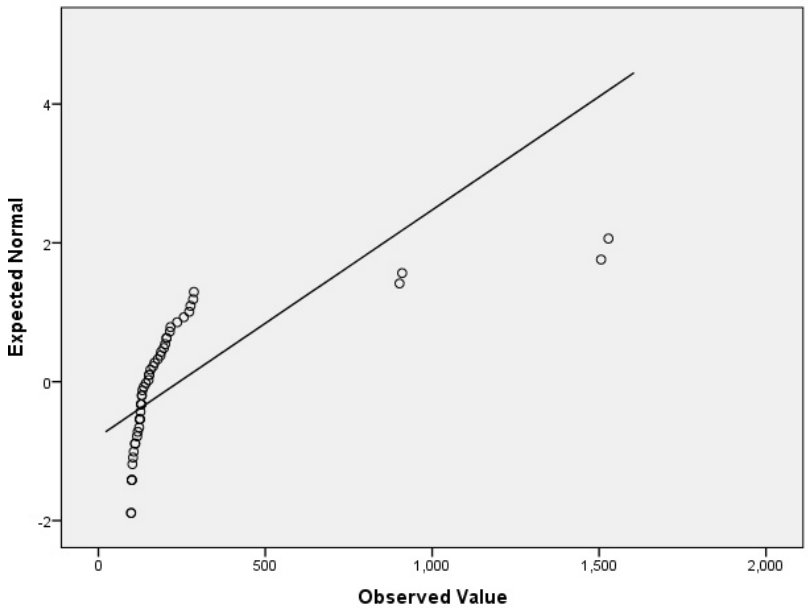

Figure 3. Quantile-Quantile (Q-Q) plot assessing the normality of word counts from Table 1.

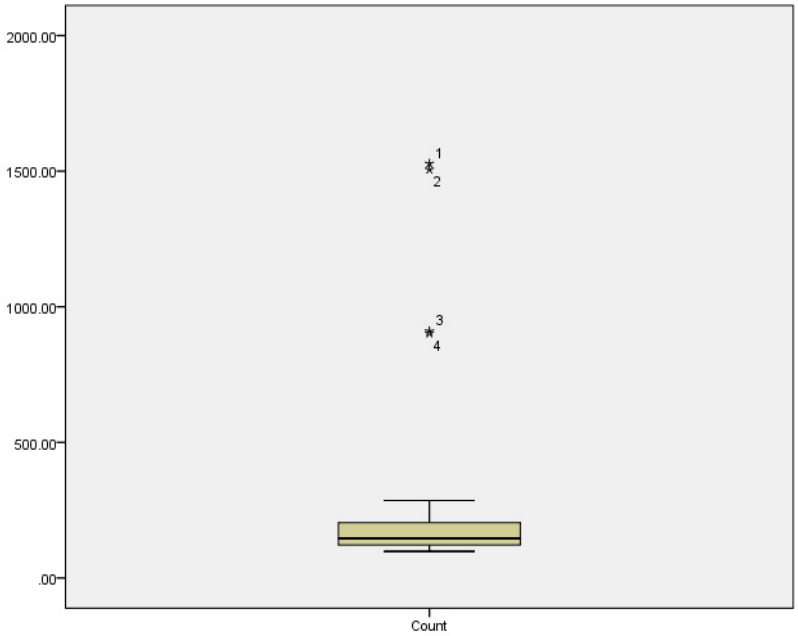

Figure 4. Box Plot highlighting extreme word frequencies from Table 1.

underscore the value of scientific communication and research collaboration. The dataset also reveals discussions around specific health issues, with hashtags like #Telehealth, #Dementia, and #NutritionFacts indicating targeted topics. Overall, the data reflect an active community engaged in promoting digital health advancements and enhancing global healthcare practices (Table 2).

Table 2. 50 most common hashtags of the #DHPSP2024 posts on X, sorted by number of occurrences.

Rank	Word	Count	Rank	Word	Count
1	#DHPSP2024	677	26	#mdpifoods	17
2	#DigitalHealth	347	27	#ExplorDHT	17
3	#PatientSafety	235	28	#EUPSA	17
4	#INPST	126	29	#DHPS	16
5	#DHPSP	115	30	#cancer	16
6	#Gratitude	63	31	#Dementia	15

Table 2. 50 most common hashtags of the #DHPSP2024 posts on X, sorted by number of occurrences. (*continued*)

Rank	Word	Count	Rank	Word	Count
7	#SciComm	63	32	#NutritionFacts	15
8	#digitalhealth	34	33	#some4pedsu	15
9	#NPMND	33	34	#Alzheimer	14
10	#mdpiantioxidants	27	35	#cardioed	14
11	#WHO	27	36	#diabetes	14
12	#Hungary	24	37	#DIgitalHealth	14
13	#DHPSP2	24	38	#DigitalHe	14
14	#Momo	23	39	#DigitalHeal	14
15	#WorldRefugeeDay	21	40	#neuro	13
16	#WithRefugees	21	41	#Machinelearning	12
17	#Croatia	21	42	#Digitalhealth	12
18	#Modric	21	43	#Health	12
19	#Binance	21	44	#HealthTech	12
20	#IGJPS	20	45	#SCINATMED	11
21	#mdpicimb	20	46	#SCICADD	11
22	#ArdaGuler	20	47	#Springer	11
23	#Telehealth	19	48	#Book	11
24	#Healthcare	19	49	#Diet	11
25	#Hospital	18	50	#HealthInformation	10

Analysis of the word counts from Table 2 using the Lilliefors test confirmed the departure from normality initially observed in Table 1 and Figures 3 and 4.

Our analysis reveals that the digital event created attention toward various networking aspects, such as healthcare innovations, scientific communication, with many underlying topics addressed such as nutrition and disease pathologies such as dementia.

Common co-occurring hashtags reveal various aspects of the networking event impact

The co-occurring hashtag data from the X posts reveal a strong emphasis on digital health and patient safety, with #DHPSP2024 frequently paired with #DigitalHealth and #INPST (Table 3). These combinations highlight ongoing initiatives in healthcare innovation and safety measures. Hashtags like #INPST and #SciComm are also commonly associated, underscoring the importance of research and scientific communication. The presence of #Gratitude and #WithRefugees indicates broader community engagement and support for global causes. This dataset reflects a vibrant X community actively discussing health advancements and social issues, fostering collaboration and awareness across diverse topics.

Table 3. 50 most common co-occurring hashtag pairs of the #DHPSP2024 posts on X.

Rank	Hashtag 1	Hashtag 2	Count	Rank	Hashtag 1	Hashtag 2	Count
1	#DHPSP2024	#DigitalHealth	158	26	#DHPSP2024	#WithRefugees	21
2	#PatientSafety	#DigitalHealth	130	27	#Croatia	#Momo	21
3	#DHPSP2024	#INPST	116	28	#Croatia	#DigitalHealth	21
4	#PatientSafety	#DHPSP2024	91	29	#Croatia	#Modric	21
5	#DHPSP2024	#DHPSP	85	30	#Croatia	#Binance	21
6	#DHPSP2024	#Gratitude	63	31	#Hungary	#WithRefugees	21
7	#SciComm	#Gratitude	63	32	#Hungary	#DigitalHealth	21
8	#DHPSP2024	#SciComm	63	33	#Hungary	#Modric	21
9	#INPST	#DHPSP	60	34	#Hungary	#Binance	21
10	#digitalhealth	#DHPSP2024	34	35	#Croatia	#WithRefugees	21
11	#DHPSP2024	#NPMND	26	36	#WithRefugees	#Momo	21

Table 3. 50 most common co-occurring hashtag pairs of the #DHPSP2024 posts on X. (*continued*)

Rank	Hashtag 1	Hashtag 2	Count	Rank	Hashtag 1	Hashtag 2	Count
12	#NPMND	#DHPSP	25	37	#WithRefugees	#DigitalHealth	21
13	#Hungary	#DHPSP2024	24	38	#Modric	#WithRefugees	21
14	#NPMND	#INPST	24	39	#Binance	#WithRefugees	21
15	#DHPSP2024	#Momo	23	40	#Croatia	#Momo	21
16	#Hungary	#Momo	23	41	#Croatia	#DigitalHealth	21
17	#DHPSP2024	#AI	22	42	#Croatia	#Modric	21
18	#DHPSP2024	#WorldRefugeeDay	21	43	#Croatia	#Binance	21
19	#Hungary	#WorldRefugeeDay	21	44	#DigitalHealth	#Momo	21
20	#WithRefugees	#WorldRefugeeDay	21	45	#Modric	#Momo	21
21	#Croatia	#WorldRefugeeDay	21	46	#Binance	#Momo	21
22	#WorldRefugeeDay	#Momo	21	47	#Modric	#DigitalHealth	21
23	#WorldRefugeeDay	#DigitalHealth	21	48	#Binance	#DigitalHealth	21
24	#Modric	#WorldRefugeeDay	21	49	#Binance	#Modric	21
25	#DHPSP2024	#WithRefugees	21	50	#ArdaGuler	#WorldRefugeeDay	20

Interestingly, the event surpassed the boundaries of academic networking to engage with global causes, as evidenced by the World Refugee Day hashtag occurring alongside the networking event main hashtag.

Analysis of the word counts from Table 3 using the Lilliefors test also revealed the same departure from normality.

Analysis of the LinkedIn #DHPSP2024 posts dataset

The LinkedIn data highlights a strong emphasis on health and technology, with prominent words like “health”, “digital”, and “healthcare” leading the conversation (Table 4, Figure 5). The frequent mentions of “research”, “patient”, and “safety” indicate a focus on advancing healthcare practices and ensuring patient well-being. Terms such as “data”, “technologies”, and “AI” (abbreviation from “artificial intelligence”) reflect the integration of digital tools in health solutions. The presence of words like “journal”, “study”, and “information” underscores the importance of knowledge sharing and research dissemination. Additionally, “networking”, “platform”, and “professionals” emphasize community engagement and collaboration. Overall, the data showcases a vibrant LinkedIn community dedicated to exploring the future of healthcare and technology (Table 4, Figure 5).

Table 4. Words sorted by occurrence.

Rank	Word	Count	Rank	Word	Count
1	health	207	26	issue	24
2	digital	155	27	special	23
3	healthcare	114	28	twitter	23
4	research	77	29	support	23
5	patient	73	30	networking	23
6	safety	48	31	technology	22
7	2024	43	32	mental	22
8	care	38	33	june	22
9	patients	36	34	systems	21
10	online	34	35	quality	20
11	data	34	36	linkedin	20
12	journal	33	37	researchers	20
13	social	32	38	intervention	20
14	join	31	39	application	19

Table 4. Words sorted by occurrence. (*continued*)

Rank	Word	Count	Rank	Word	Count
15	technologies	29	40	review	18
16	information	29	41	clinical	18
17	X	28	42	access	18
18	future	27	43	treatment	18
19	study	27	44	professionals	18
20	AI	26	45	insights	18
21	potential	26	46	work	18
22	platform	26	47	science	18
23	medical	25	48	monitoring	17
24	analysis	25	49	medicine	17
25	impact	25	50	outcomes	17

Figure 5. Word cloud of the most occurring words in the #DHPSP2024 posts on LinkedIn supports the diverse topic areas discussed during the networking event.

Analysis of the word counts from Table 4 using the Lilliefors test also reveals the respective departure from normality.

Interestingly, LinkedIn data analysis showed a considerable outreach toward practical topics related to medical research, such as “mental health”, “researcher”, “patient”, and “intervention”.

50 most common hashtags of the LinkedIn posts

The LinkedIn data showcases a diverse array of hashtags, with a significant focus on health and technology (Table 5, Figure 6). The most frequently used hashtags are #DHPSP2024, #DHPSP, and #DigitalHealth, indicating a strong emphasis on digital health and patient safety. Other notable hashtags include #PatientSafety, #ExplorDHT, and #healthcare, underscoring the importance of healthcare and patient well-being. Additionally, there’s a presence of hashtags related to professional and academic communities such as #INPST, #NPMND, and #IIST. The data also highlights interests in specific fields like #physiotherapy, #NutritionFacts, and #DataScience. The variety of hashtags, including those with just one mention, like #technology, #telehealth, and #AI, reflects a broad engagement with topics spanning health, technology, and professional development on LinkedIn (Table 5, Figure 6).

Similarly to the data from Tables 1–4, analysis of the word counts from Table 5 using the Lilliefors test also reveals the departure from normality.

Table 5. The most common hashtags of the LinkedIn #DHPSP2024 posts, sorted by occurrence rate.

Rank	Hashtag	Count	Rank	Hashtag	Count
1	#DHPSP2024	49	26	#HealthInformation	1
2	#DHPSP	17	27	#telehealth	1
3	#DigitalHealth	15	28	#Biobased	1
4	#INPST	14	29	#Participated	1
5	#PatientSafety	9	30	#Resource	1
6	#ExplorDHT	9	31	#SIG	1
7	#NPMND	3	32	#nursing	1
8	#healthcare	3	33	#Delivered	1
9	#physiotherapy	2	34	#Book	1
10	#NutritionFacts	2	35	#CRC	1
11	#Happy	2	36	#Taylor	1
12	#IIST	2	37	#International	1
13	#IIMR	2	38	#Nutrition	1
14	#health	2	39	#BMC	1
15	#digitalhealth	2	40	#Springer	1
16	#PsychTwitter	2	41	#Frontiers	1
17	#DataScience	2	42	#IIP	1
18	#HealthInvestment	1	43	#Serve	1
19	#APTI	1	44	#AI	1
20	#Delight	1	45	#Healthcare	1
21	#CMC	1	46	#IACAPAP2024	1
22	#Bentham	1	47	#YouthMentalHealth	1
23	#technology	1	48	#mHealth	1
24	#Indian	1	49	#EHealth	1
25	#Team	1	50	#Socialmedia	1

Figure 6. Word cloud of the 50 most common LinkedIn hashtags of the #DHPSP2024 posts.

Taken together, the data analysis of X versus LinkedIn data could indicate that although both events share a common theme, they also differentiate into distinctive areas of influence.

Qualitative analysis of the content revealed the dominant thematic clusters, among which the most frequent were telemedicine as a way to ensure continuous patient care, the use of AI in the diagnosis and prediction of diseases, the use of digital sensors in monitoring chronic conditions, and the introduction of digital pharmacovigilance systems and tools based on “digital twins” for modeling public health, etc.

Discussion

The systematization of the data obtained and summing up the results showed that the participants appreciated digital health as an area that is actively developing and improving. The network event provided an excellent opportunity for scientists from different countries to establish and strengthen cooperation in the field of digital health and patient safety.

A comparative analysis of the data with X and LinkedIn shows that both platforms focus on digital health and patient safety, but have different orientations. Posts on both social media platforms use the hashtags #DigitalHealth, #PatientSafety, and #INPST, but X posts are more oriented towards science communication (#SciComm) and LinkedIn posts are more oriented towards professional issues (e.g., #DataScience). X posts highlight social topics such as support for refugees (#WithRefugees), while LinkedIn posts focus on professional and research issues. Both platforms contribute to networking, aiming at the advancement of digital health.

The following section describes a number of themes of the #DHPSP2024 posts on the main directions of a network event for purposes of illustration, not limitation.

Posts about personal research and new publications

General issues of digital health

As part of the network event, general and private issues of digital health were discussed. One of the prominent discussions on general health issues was, for example, a post on the analysis of the 100 most significant publications on digital and mobile health. The study not only showed key areas of development, but also confirmed that technologies improve the quality of life of people (treatment of depression, control of diabetes, or support for patients with COVID-19, etc.). Such bibliometric analyses are important for tracking trends and directions in digital health as well as other research areas [24–26].

Along with the above is an analysis of the main barriers to the use of digital technologies in healthcare, including infrastructure problems, psychological obstacles, and concerns about increasing workload. At the same time, training and perceptions of the effectiveness of technology and multisectoral incentives contribute to greater digital decision-making by health professionals [27].

Participants in the network event noted the impact of the COVID-19 pandemic on the development of digital technologies. Three categories of digital health are identified: telemedicine, digital access tools, and digital monitoring, improving health services and helping health systems adapt to the post-pandemic world [28].

Digital healthcare perspectives, including cloud computing, artificial intelligence/machine learning (AI/ML) advances, and wearable sensors automating many aspects of healthcare, driving the development of personalized medicine, are also presented. Concerns of healthcare workers and patients were noted [29].

Perspectives on the use of social media in health care

Participants also considered the prospects for using social networks as a tool for scientific communication and the promotion of knowledge in medicine. So, X has become an important platform for sharing knowledge. It is noted that changes in its management raise concerns [30]. Along this line, hashtags such as #PsychTwitter and #NutritionFacts have contributed to the global promotion of topical aspects of psychiatry and nutrition information, reaching millions of users [31, 32].

Diagnosis using digital technologies

Participants also presented the latest information on the possibilities of diagnostics using AI and ML. In ophthalmology, AI has been reported to show potential for early screening for dry eye syndrome [33]. In oncology, the MRD-EDGE platform, using ML, enables blood levels of circulating tumor DNA (ctDNA) to be monitored in a variety of cancer types, including lung cancer and melanoma. This approach eliminates the need to analyze tumor tissues, which is important for patients on immunotherapy [34].

Telemedicine

Telemedicine also caught the attention of the participants at the #DHPSP2024 digital networking event. In particular, it was reported that during the COVID-19 pandemic, telecardiology contributed to the continuity of treatment and prevention of cardiovascular diseases [35, 36]. The readiness of medical staff to use telemedicine solutions in intensive care units was also discussed, with simplicity and alignment with current workflows being key factors for successful integration [37].

The mention of telecardiology being used during the COVID-19 pandemic to maintain care continuity [35, 36] underscores how telemedicine enabled critical cardiovascular services to continue despite lockdowns, directly contributing to patient safety. Participants' discussions of staff readiness for tele-ICU systems highlighted that simplicity and alignment with existing workflows are key for successful integration of telemedicine in intensive care settings [37]. This emphasizes the practical considerations required for digital solutions to be effective in real-world healthcare environments.

Digital twin technologies in healthcare

An important issue has also become the relevance of the use of digital twin technologies to optimize mass vaccination and disease monitoring, despite the economic, social, and ethical challenges [38].

The discussion on digital twin technology for vaccination and disease monitoring illustrated its potential in public health planning. For example, a digital twin of a patient population can simulate different vaccination rollout scenarios to optimize coverage and predict outcomes, enhancing preparedness. Despite this optimism, participants noted significant economic, social, and ethical challenges in implementing such large-scale digital simulations [38]. This indicates that while digital twin approaches are promising, their real-world application requires careful navigation of those challenges.

Internet of medical things: digital sensors in medicine

The network event covered topics related to the Internet of Medical Things (IoMT), particularly in the context of developing digital sensors for continuous disease monitoring. It was emphasized that recent studies and patent trends demonstrate progress in creating non-invasive devices for monitoring glucose levels and blood pressure, significantly improving the management of chronic diseases such as diabetes and hypertension [39, 40]. These regulatory-approved technologies open new opportunities for personalized and effective patient treatment. The importance of digital health for children with type II diabetes in schools was also discussed. A digital platform was highlighted that helps regulate deep sleep and monitor glucose levels, improving the health and well-being of patients [41]. Digital pills with ingestible sensors can enhance treatment in areas such as mental health, HIV/AIDS, pain management, cardiology, and oncology, improve adherence to prescriptions, and reduce healthcare costs [42].

In the context of IoMT, participants highlighted the development of smart sensors for continuous disease monitoring. For instance, wearable devices that continuously track blood glucose or cardiac rhythms were mentioned as examples of IoMT innovations enabling real-time patient monitoring. Such examples demonstrate how IoMT can facilitate early detection of health anomalies and improve long-term management of chronic conditions by connecting patients' physiological data directly to healthcare providers.

New approaches in medical education using digital technologies

At the network event, new approaches to education using digital technologies were actively discussed. It has been reported that digital learning, especially in medical disciplines, has significantly increased student satisfaction and improved material acquisition, especially in the context of the COVID-19 pandemic [43]. The introduction of AI, including technologies such as ChatGPT, is transforming medical education and clinical management, but requires caution when applying [44–46]. Concerns have been noted regarding ChatGPT's ability to generate inaccurate medical and scientific data, including non-existent citations [47]. This can lead to the dissemination of inaccurate information and requires special attention when using such technologies.

Digital technologies in drug development and pharmacovigilance

Special attention was given to the digital aspects of drug development. Tools for molecular modeling and virtual screening were presented, which contribute to more efficient drug design [48]. It was reported that molecular docking and in vitro studies of two new TOP2β inhibitors were conducted and yielded interesting outcomes. Despite good binding affinity, the studied compounds were less effective in inhibiting cellular proliferation compared to etoposide [49]. The potential of digital technologies for preventing drug side effects at various stages of pharmaceutical development, including molecular design, ML, and others, was highlighted [50]. A developed BERT model for extracting data on drug side effects from social media was reported, enhancing pharmacovigilance [51]. AI is also being actively used to optimize clinical trials, accelerating diagnostic processes and patient management [52]. These advancements open new opportunities for improving treatment efficacy and patient safety.

Implementing AI in health insurance

Questions have been raised about the implementation of AI to predict health insurance claims [53]. Key factors such as smoking, body mass index, and blood pressure have been identified as affecting forecasting, which could lead to cost savings for insurance companies.

Patient safety and quality of care

The topic of the network event also included issues of patient safety and improving the quality of treatment. One post highlighted research in Austrian hospitals that identified key factors affecting patient safety, such as open communication and executive actions, and showed differences in perceptions of safety culture among doctors, nurses, and other staff groups. The results confirmed that the safety culture has significant potential for improvement and recommended evidence-based practices to improve safety and treatment outcomes [54]. Considering the use of digital technologies in long-term care facilities for the elderly, the authors note that text processing and ML improve the quality of care and contribute to more informed decision-making [55].

One important aspect of the discussion has been obesity research, which is associated with endocrine, genetic, and metabolic disorders that increase the risk of cardiovascular disease and diabetes, which requires an integrated approach to treatment and prevention [56]. Monkeypox prevention measures were also considered, including understanding transmission mechanisms and developing effective vaccines [57].

The network event also actively discussed key studies and new approaches in the treatment and diagnosis of neurological diseases. One interesting post addressed the role of brain connectivity disruptions, as seen in magnetic resonance imaging scans, as precursors to dementia [58]. Special attention was given to the study of the impact of diet on the development of neurodegenerative diseases. Adherence to a Mediterranean diet was found to be associated with improved cognitive functions, particularly in individuals at risk of Alzheimer's disease [59]. Additionally, data were presented on the significance of natural compounds in the treatment of neurodegenerative diseases. The use of phytochemicals from plants and aquatic organisms, combined with nanotechnology, opens new prospects for enhancing the therapy of these diseases [60]. New therapeutic approaches to the treatment of depression were also discussed. Augmented depression therapy (ADepT) showed higher effectiveness than cognitive-behavioral therapy, particularly in terms of improving well-being and reducing depressive symptoms [61]. Clinical trial results were also presented, showing the positive effects of probiotics and prebiotics on the psycho-emotional state of patients with depression. These data highlighted the importance of maintaining a healthy microbiome for the prevention and treatment of mental health disorders [62]. The role of social interactions in maintaining physical and mental health was also discussed. Research demonstrated that having social connections significantly contributes to better health, while social isolation can have a destructive impact on the body [63]. Furthermore, the experience of using the Calm mobile app to reduce stress in students was presented [64].

Participants in the networking event actively discussed research on natural compounds with various biological activities. Thus, the health benefits of anthocyanins contained in grapes, various berries, rice, corn, potatoes, and other products [25] are reported. The results of studies concerning the beneficial properties of *Syzygium jambos* fruits and seeds [65] are also presented. Analgesic and anti-inflammatory effects of *Aerva javanica* extracts [66] were found. The immunomodulatory effect of rosmarinic acid from *Punica granatum* [67] and the antioxidant and anti-inflammatory properties of saffron [68] have been reported. In addition, data are provided on synthesized *O*-alkyl derivatives of organic acids that have demonstrated antioxidant properties and the ability to protect dietary fats from oxidation, which opens up prospects for improving the quality of food [69].

Search for partners and vacancies in the scientific field

The networking event discussed finding collaborative partners and jobs, and featured research award opportunities such as the 2024 Young Investigator Award (2,000 CHF; Application Deadline 31 December 2024), a PhD position within the natural products research laboratory at the University of Strathclyde, a PhD studentship in the Centre for Skin Sciences, University of Bradford, the Patchwork Health Clinical Fellowship Program, and a project assistant position (Department of Biological Sciences & Biotechnology, Faculty of Science & Technology, UKM), and a PhD position in AI/ML Algorithms for 6G Telemetry Systems (Netherlands), and a specialist job opening in textual analysis for creating collaborations, etc.

Announcements of special issues and scientific journals

Participants in the network event paid special attention to the announcements of special issues of the journals, such as "Insight in Pharmacological Treatment of Pain" in the journal Frontiers in Pain Research, "Exploration of Digital Health Technologies", Special Issue "Applications of Cheminformatics and Machine Learning in Predictive Modeling of Property and Toxicity Endpoints of Nanoparticles" in Computational and Structural Biotech Journal, Biomolecules Special Issue "Therapeutic Potential of Natural Products in Metabolic Diseases"; Pharmaceutics Special Issue "Computational Intelligence Tools in Applications of Pharmaceutics", etc. In addition, book and patent publications were presented, as well as information on changes to the JCR list in 2024.

Announcements about scientific events and conferences

The network event posts featured announcements of seminars, lectures, and conferences such as AARM 2024, 1st International Conference on Autism Advanced Research and Management in Athens, 27th Annual National Convention of the Association of Pharmaceutical Teachers of India (APTICON-2024), and UCL Open Science Conference 2024, among others.

Other digital health solutions

Various digital health technologies and developments were also highlighted, such as Liminal VR virtual reality to improve learning and corporate health, the NaviCam system for non-invasive stomach exams, and the BMind smart mirror using AI to improve mental health. In addition, best practices in chemical characterization of plant extracts and safe digital health monitoring solutions [70], and a video regarding early detection of colorectal cancer, among others, were discussed.

Overall, the event posts referenced several cutting-edge technologies across various healthcare domains. For example, Liminal VR, a virtual reality platform for improving learning in corporate health training, illustrates how immersive technology can be leveraged in healthcare professional education and workplace wellness. Also highlighted was the NaviCam system, an ingestible capsule endoscopy device for non-invasive stomach examinations, reflecting an advancement in gastroenterology that enhances patient comfort and safety by avoiding traditional endoscopy procedures. Similarly, the BMind smart mirror, which uses AI to support mental health, was noted as an unobtrusive digital tool to monitor and promote wellbeing in everyday settings. Participants also shared best-practice guidelines [70] for safe digital health monitoring and a video on early detection of colorectal cancer. This sharing of resources demonstrates how

the community used the #DHPSP2024 event not only to spotlight new technologies but also to disseminate knowledge and raise awareness about patient safety practices (for example, standardizing approaches to digital health research and promoting important public health messages).

Interpretation of key insights and practical implications

A key observation from the event's data is the prominence of telemedicine and AI in the conversations. This suggests a collective recognition among participants that these technologies are crucial drivers for enhancing patient safety and healthcare quality. For instance, repeated references to telehealth initiatives indicate its established role in maintaining continuity of care and expanding access to services. Meanwhile, enthusiasm for AI-driven tools—from diagnostics in ophthalmology and oncology to decision-support in mental health—highlights the expectation that intelligent systems will increasingly support clinical decision-making and personalized treatment. These insights align with broader trends in digital health and confirm that global stakeholders are actively focusing on technologies with immediate practical impact.

Another important implication of our findings lies in the distinct ways different social platforms were used during the event. X and LinkedIn served complementary purposes: X facilitated rapid science communication and community building (e.g., sharing research highlights with hashtags like #SciComm), whereas LinkedIn was utilized for professional discourse and networking (e.g., discussions on data science applications and calls for collaboration). This dual-platform dynamic suggests that future digital health networking initiatives can maximize reach and engagement by leveraging each platform's strengths—using the real-time, inclusive conversations on X to generate interest, and the more formal professional exchanges on LinkedIn to deepen discussions. For event organizers and communicators, understanding this distinction is valuable for tailoring strategies to better connect with the intended audience on each platform.

From a practical perspective, our analysis provides a snapshot of emerging priorities in the digital health and patient safety landscape. The wide geographic participation (posts from 38 countries) underscores that improving patient safety through digital innovation is a globally shared concern, and it demonstrates how social media can bridge diverse regions in health discussions. Readers can glean which areas—such as telecardiology, AI-powered diagnostics, IoMT for chronic care, and VR-based health training—are currently capturing the community's attention and investment. Such awareness can help healthcare professionals and policymakers recognize promising digital solutions and identify opportunities for collaboration. For example, the strong interest in telemedicine even after the acute phase of the pandemic suggests that health systems should continue integrating virtual care into standard practice. Similarly, the community's enthusiasm for novel AI tools may encourage targeted research funding and cross-disciplinary partnerships to further develop and implement these innovations.

Finally, we acknowledge the limitations of using social media content as research data when interpreting our findings. Our analysis captures participants' engagement and perspectives during a networking event, which offers insight into community interests but does not directly measure the real-world effectiveness or outcomes of the technologies discussed. Accordingly, we have confined our conclusions to describing how the digital health community interacted and what topics were trending, rather than making broad generalizations about healthcare impact. This approach ensures our interpretations remain grounded in the available data and avoids overstating the implications.

Despite these limitations, we believe that capturing this moment in the digital health discourse is valuable. By identifying what experts and stakeholders found noteworthy during #DHPSP2024, our study provides an early indicator of where innovation and collaboration efforts are headed in this field. In adopting this balanced approach, we aim to offer meaningful insights to readers while maintaining appropriate caution.

Looking forward: advancing digital health through policy, ethics, and global collaboration

As digital health technologies continue to evolve, their integration into healthcare systems is expected to accelerate, transforming care delivery toward a more personalized, predictive, and participatory model. AI

will likely expand its role in diagnostics, decision support, and administrative automation, while digital therapeutics and remote monitoring tools will enhance chronic disease management and early intervention strategies [29]. However, these advances bring complex challenges that must be addressed to ensure equitable and ethical adoption. Ensuring health equity—especially among underserved populations with limited digital access or literacy—remains a top priority, alongside safeguarding cybersecurity and data privacy in increasingly interconnected health ecosystems [6, 50]. Regulatory systems must also adapt to assess the safety, efficacy, and interoperability of rapidly emerging tools such as AI algorithms and wearable devices [34]. Furthermore, ethical concerns, including algorithmic bias, transparency, and patient autonomy, demand frameworks that promote inclusivity, informed consent, and accountability in digital applications [47, 71]. Global and cross-sectoral collaboration will be pivotal in addressing these concerns. Initiatives such as the WHO's Global Initiative on Digital Health (GIDH) and the Global Digital Health Partnership (GDHP) exemplify efforts to align digital health strategies, infrastructure, and policy at a transnational level [72, 73]. These platforms aim to support countries in moving from fragmented pilot projects to sustainable digital ecosystems, ensuring that innovations translate into safer, more effective, and more accessible care. The insights gained from the #DHPSP2024 event underscore the need to proactively anticipate these dynamics, enabling the digital health community to shape a future that is not only technologically advanced but also ethically responsible and globally inclusive.

Conclusions

Based on the results of the network event, the following conclusions and recommendations can be made. The networking event facilitated the exchange of ideas and experiences, providing opportunities for participants to find collaborators, collaborative projects, and to strengthen scientific ties. This stimulates the formation of new models of digital health and the introduction of advanced solutions to improve patient safety and quality of care. The data obtained can be used to develop educational programs, improve digital interfaces, implement AI solutions, and create patient safety monitoring platforms.

The application of the principles of open innovation within the event accelerated the process of finding and implementing new ideas, which might be significantly surpassing the traditional "closed" model of innovation in speed and efficiency. In addition, the event has become a source of motivation for researchers. The opportunity to present their scientific works to the scientific community will contribute to their wide distribution and increased visibility, which might have a positive effect on future citations of scientific publications. Messages about upcoming conferences will allow participants to expand their professional knowledge and improve their skills. The DHPSP platform benefited from the additional networking opportunities that will hopefully promote further fruitful cooperation, with the potential to contribute to the successful implementation of future digital health and patient safety solutions.

Abbreviations

AI/ML: artificial intelligence/machine learning

DHPSP: Digital Health and Patient Safety Platform

INPST: International Natural Product Sciences Taskforce

IoMT: Internet of Medical Things

WHO: World Health Organization

Declarations

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Author contributions

OL: Conceptualization, Methodology, Formal analysis, Investigation, Writing—original draft. MEM: Conceptualization, Methodology, Formal analysis, Investigation, Writing—review & editing. MM: Formal analysis, Investigation, Writing—review & editing. LBI: Formal analysis, Investigation, Writing—review & editing. EO: Conceptualization, Methodology, Visualization, Writing—review & editing. AGA: Conceptualization, Methodology, Formal analysis, Investigation, Writing—original draft. AWKY, JE, YK, MMR, ZS, KL, BS, AK, AOA, CVS, HKB, FMU, SMSI, JKP, GD, GV, HC, JN, AF, AGG, MRS, DEE, KOA, Michał Ł, YQ, EBS, G Li, HPD, WM, JGM, NTT, RKG, OA, GK, FBM, BNS, DW, JS, JOH, KW, EDP, A Jóźwik, NK, SBB, BHG, TYW, BSG, Marcin Ł, AS, FS, STW, RL, FAN, RKS, AM, HM, A Juhi, SM, M Cenanovic, CT, R De, SSC, R Damaševičius, M Cascella, G Lisco, VT, and OED: Conceptualization, Validation, Writing—review & editing. All authors read and approved the submitted version.

Conflicts of interest

Atanas G. Atanasov is the Editor-in-Chief of Exploration of Digital Health Technologies. Atanas G. Atanasov is an Advisory Board member of QluPod AG, a health-tech company aiming for the development of innovative telehealth solutions. Yousef Khader, Zafar Said, Josef Niebauer, Alexandros G. Georgakilas, and Eliana B. Souto are Associate Editors of Exploration of Digital Health Technologies. Sheikh Mohammed Shariful Islam, Mohammad Reza Saeb, and Jamballi G. Manjunatha are both Associate Editors and Guest Editors of Exploration of Digital Health Technologies. Andy Wai Kan Yeung, Md. Mostafizur Rahman, Anastasios Koulaouzidis, Adeyemi O. Aremu, Ganesh Venkatachalam, Hari Prasad Devkota, Nikolay T. Tzvetkov, Dongdong Wang, Jivko Stoyanov, Emil D. Parvanov, and Marco Cascella are Editorial Board members of Exploration of Digital Health Technologies. Robertas Damaševičius is a Guest Editor of Exploration of Digital Health Technologies. Atanas G. Atanasov, all the Editorial Board members, Associate Editors, and Guest Editors mentioned above had no involvement in the decision-making or the review process of this manuscript. The other authors declare that they have no conflicts of interest.

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Availability of data and materials

The data analyzed for this study are included in the manuscript, and additional information can be obtained from the corresponding authors upon request.

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