# The effect of Covid-19 in digital media use of Finnish physicians

Minna Isomursu, Reija Kuoremäki, Mika Teikari

Submitted to: Journal of Medical Internet Research
on: April 01, 2021

# *Table of Contents*

# The effect of Covid-19 in digital media use of Finnish physicians

Minna Isomursu[1] MSc, PhD; Reija Kuoremäki[2] MSc; Mika Teikari[2] MSc

[1]University of Oulu Oulu FI
[2]Success Clinic Helsinki FI

**Corresponding Author:**
Minna Isomursu MSc, PhD
University of Oulu
Pentti Kaiteran katu 1
Oulu
FI

## *Abstract*

**Background:** Covid-19 pandemic has boosted digitalization in healthcare, as mobility restrictions and social distancing rules have made healthcare providers to adopt digital tools to replace or complement face-to-face interactions.

**Objective:** In this paper, we discuss results of a survey study about the effects of Covid-19 pandemic on physician's use of digital media. We examine whether Covid-19 conditions have changed how physicians use internet resources for information search, how they engage in social media, and how they participate in online events.

**Methods:** The study compares a survey conducted in Finland in spring 2020 with two identical surveys done in 2019 and 2018. Spring 2020 was the time when Finland executed mobility restrictions and re-organization of healthcare because of pandemic. Comparing results of this survey with the results of two previous years gives us a unique opportunity to do comparative analysis if the results of Covid-19 spring are different from earlier years.

**Results:** Our results show that the use of digital media for information search did increase, but not more than the steadily rising trend of previous years. Use of print media was still strong, and complementary digital media sources had already been relatively high prior 2020 and continued to stay in that level. Use of social media had also been steadily rising among physicians, and this steady rise continued in 2020. However, our results indicate that Covid-19 situation had an effect on physician's participation in online events organized by healthcare ecosystem stakeholders. There was a rise in numbers in participation to online congresses, symposia and training, and physicians took part in more eDetailing organized by healthcare ecosystem actors.

**Conclusions:** As use of digital media including social media was already high prior Covid-19 in Finland, our results do not show significant change because of special circumstances in 2020. However, our results show increased participation in online events. With increased participation, also the attitudes towards organized online events had changed more positive, which could indicate that the higher participation numbers could continue also when pandemic related restrictions will be removed.

(JMIR Preprints 01/04/2021:29305)
DOI: https://doi.org/10.2196/preprints.29305

## Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**
Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.
Only make the preprint title and abstract visible.
No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**
Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain v
Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <a href="http

# Original Manuscript

# The effect of Covid-19 in digital media use of Finnish physicians


## Abstract

*Background*: Covid-19 pandemic has boosted digitalization in healthcare, as mobility restrictions and social distancing rules have made healthcare providers to adopt digital tools to replace or complement face-to-face interactions.
*Objective*: In this paper, we discuss results of a survey study about the effects of Covid-19 pandemic on physician's use of digital media. We examine whether Covid-19 conditions have changed how physicians use internet resources for information search, how they engage in social media, and how they participate in online events.
*Methods*: The study compares a survey conducted in Finland in spring 2020 with two identical surveys done in 2019 and 2018. Spring 2020 was the time when Finland executed mobility restrictions and re-organization of healthcare because of pandemic. Comparing results of this survey with the results of two previous years gives us a unique opportunity to do comparative analysis if the results of Covid-19 spring are different from earlier years.
*Results*: Our results show that the use of digital media for information search did increase, but not more than the steadily rising trend of previous years. Use of print media was still strong, and complementary digital media sources had already been relatively high prior 2020 and continued to stay in that level. Use of social media had also been steadily rising among physicians, and this steady rise continued in 2020. However, our results indicate that Covid-19 situation had an effect on physician's participation in online events organized by healthcare ecosystem stakeholders. There was a rise in numbers in participation to online congresses, symposia and training, and physicians took part in more eDetailing organized by healthcare ecosystem actors.
*Conclusions*: As use of digital media including social media was already high prior Covid-19 in Finland, our results do not show significant change because of special circumstances in 2020. However, our results show increased participation in online events. With increased participation, also the attitudes towards organized online events had changed more positive, which could indicate that the higher participation numbers could continue also when pandemic related restrictions will be removed.


Keywords: digital media, social media, covid-19, information search

## Introduction

Digitalization of healthcare has been expected to transform healthcare delivery, and Covid-19 has been proposed to provide a reason to fully embrace the digital transformation (Golinelli et al., 2020; Keesara et al., 2020). Due to mobility restrictions and social distancing rules, many healthcare practices based on face-to-face interactions become difficult, if not impossible. Also, preparing to sudden increase in patients with new, severe symptoms has caused re-prioritization of healthcare, leading to postponing non-urgent care and re-organization of work of healthcare professionals.

In this paper, we investigate if Covid-19 has had an impact of physicians' use of digital media. We performed a survey study among physicians in Finland. The survey was administered during Spring 2020, when Finland was experiencing the first wave of Covid-19, with state enforced mobility restrictions and strong recommendations for social isolation. The survey focused on physician's self-reported usage and experiences of digital media in their everyday work. The survey succeeded two other identical surveys conducted in adjacent years 2019 and 2018. By comparing the survey results of these three years, we are answering a research question:

*"Has Covid-19 increased the use of digital media of Finnish physicians?"*

## Prior work

Digital resources have become important in fulfilling everyday information needs of medical professionals. Medical professionals use digital resources to seek information at the point of care, to update their professional know-how, and to communicate with colleagues (Kritz et al., 2013). They obtain new information or confirm diagnostic or therapeutic decision (Brigo et al., 2020) through internet. In addition to medical professionals, also patients and informal carers can benefit from using internet as a source of health information (Lavorgna et al., 2017). Recent evidence shows, that use of online resources in information search in European physicians is prevailing method to fulfil information needs, while offline resources are used more seldomly (Demergazzi et al., 2020).

Whereas using internet to fulfil information needs is already widespread, use of social media by medical professionals for professional purposes has been reported still to be relatively low. For example, a survey made in 2018 among active physicians in the field of epilepsy in Italy found out that whereas almost all the respondents used internet to seek information, as much as 81,5% told that then never follow blogs or online forums on epilepsy. The same study reported that the medical professionals mostly accessed PubMed and EMBASE (95,5% of the respondents) and website of national epilepsy chapter (78,4%) (Brigo et al., 2020). In a 2018 survey among healthcare professionals in United Arab Emirates, it was found that 53% of the healthcare professionals reported that they used social media platforms to exchange peer medical information (Hazzam & Lahrech, 2018). In this study, WhatsApp was found to be most used with 65.5% of respondents using it, followed by Facebook and YouTube with approximately 50% of HCPs reporting using them. There is indication that social media does have an influence especially in the patients' decision making (Aceto et al., 2018; Lavorgna et al., 2017) and in providing patients a channel for expressing emotional responses to their condition and related care (Giunti et al., 2020), suggesting that the use of social media in healthcare might be actually driven by patients, not healthcare professionals. There is some evidence that Covid-19 has increased the use of social media to disseminate health-related information in both health media and in healthcare professionals (Pérez-Escoda et al., 2020).

Social distancing and mobility restrictions hinder healthcare ecosystem to organize events that allow person-to-person communication and information sharing. Academic detailing is one of the practices that benefits from in-person peer education visits to improve patient outcomes, and is suffering from Covid-19 related restrictions (Smart et al., 2021). Medical congresses facilitating learning and networking of the community have been postponed or cancelled (Porpiglia et al., 2020).

However, high numbers of internet use among medical professionals are not valid in all parts of the world. For example, a study made in Ethiopia reported that only about half (47.4%)
of the medical professionals access Internet regularly for professional purposes (Shiferaw & Mehari,

2019). Also, as the possibilities of digital media are getting more advanced, healthcare professionals have been found to express needs related to increasing their digital health literacy skills to be able to integrate new digital information to care practice (Slevin et al., 2019). Finland, on the other hand, is generally seen as a forerunner in regards digitalization of healthcare and use of internet for healthcare related information search (Hornmoen et al., 2020). Finnish healthcare sector is advanced in digitalization. For example, use of electronic health records (EHRs) is reaching 100% (Heponiemi et al., 2018) and the percentage of population using eHealth services is the highest in the European Union (Värri et al., 2020). Widespread use of digital health-related media sources among Finnish healthcare professionals has been recognized to create opportunities for new innovations in creating prediction models in healthcare. For example, research has shown that monitoring of online searches done by Finnish physicians can be used for early detection of epidemics (Pesälä et al., 2019).

# Method

## Survey instrument

The survey instrument used to answer the research question has been developed to monitor how different communication channels reach healthcare professionals in Finland. This knowledge has been disseminated to healthcare ecosystem stakeholders, such as pharma companies, health technology providers and policy makers for optimizing the choice of communication channels for different purposes. The questions have been refined through a collaborative process of healthcare ecosystem stakeholders and the company administering the survey (Success Clinic, later referred as SC in this paper). For the purpose of this paper, we chose only survey questions relevant to our research question. The survey has been repeated yearly for over the period of 10 years, and the questions selected for this study have been identical for the three years period analyzed in the study reported here.

The questions selected for the purpose of this study were the following (translated from Finnish by the authors):

1. How are the media you use at work distributed among the following options?
    - Print media
    - Internet (service includes ads)
    - Internet (service does not include ads after login)
2. How often do you use the following social media services:
    - WhatsApp, YouTube, Facebook, Instagram, Twitter, LinkedIn (the survey had more options, we selected these to this paper based on the significance)
    - Daily, Weekly, Monthly, Once in three months, Couple of times a year, More seldom, Never
3. Currently, what is the role of social media in your work?
    - Significant role
    - Moderate role
    - Minor role
    - No role in my work
4. Are you part of some private social media group where you can have a dialogue with other health care professionals about your work?
    - Yes, in several
    - Yes, one
    - No, but I have been considering joining

- No, but I would like to
- No, I do not want to

5. Have you participated in the following types of organized events in the past year?
    - The eCongress or eSymposia or Webinar
    - Online promotion or presenting products
    - eTraining (i.e. a lecture or more detailed information about some specific illness)
6. How do you see the shift of product trainings from face-to-face personal/ group trainings to online remote trainings?
    - Positive
    - Negative
    - Neutral

The survey was administered online. The survey instrument was implemented with Webpropol. Invites were sent by email.

## Data collection and analysis

Data collection and analysis was designed and executed as a collaboration between university researchers and SC. SC sponsored the research by allowing the researchers an access to their survey database, which they had been constructing for over 10 years to collect and disseminate information about healthcare professional's use of digital media. SC also performed all analysis requiring access to raw data. The role of academic researchers was to design the research setup, question, approach and use the results to derive research conclusions.

The participants were recruited through SC panel of Finnish healthcare professionals. The panel has been constructed in an iterative process of more than 10 years of operating in the Finnish healthcare ecosystem. The panel is a representative sample of Finnish physicians. It includes majority of registered physicians in Finland, 27254 physicians in year 2018.

The data was stored in SC data server located in Finland. SC is a registered registry operator, and it follows GPDR regulations in data storage and management. For the purpose of this study, all data analytics were done by SC personnel using SC servers and computing resources.

The data covers years 2018, 2019 and 2020. Even though the survey instrument has evolved slightly during the years, the questions examined in this paper have remained identical. Also, the process of administering the survey has followed the same protocol every year. Cherries table (Eysenbach, 2004) is provided in appendix for describing the details of the survey design and protocol.

For the purpose of this study, we selected only respondents who had registered themselves in the SC panel as "physicians". The survey was sent to a larger population of healthcare professionals, but other professionals were excluded from this analysis. Demographics are descrbed in appendix tables.

Data analysis has been done with Microsoft Excel. Data analysis includes creation of summative graphic representations of distribution of answers, and $\chi^2$-test (Chi-squared test) for identifying statistical significance of differences between years.

# Results

We group our findings here into three broad categories according to the type of media as follows:

1. Media services. This category includes external media services based on broadcasting model, where media content is created and/or curated primarily by the service provider. These media services include, for example, professional magazines and national databased used to communicate standard care information.
2. Social media. This category includes social media platforms, where the content is both produced and consumed by the users. Examples are Twitter, Facebook and LinkedIn.
3. Participation in organized online events. The organized online events were grouped into three broad groups as follows: (1) online congress or symposia, (2) online training, and (3) eDetailing. eDetailing services were described in the survey to mean marketing services used by pharmaceutical companies or other product/service providers to distribute information about their offerings.

## Use of media services

The physicians reported that their use of print and internet-based media services had remained relatively stable when compared to previous years (Error: Reference source not found). Digital media is clearly more common (74% of respondents) way to access professional information compared to print media (26% respondents), and this has remained the same for the past three years.

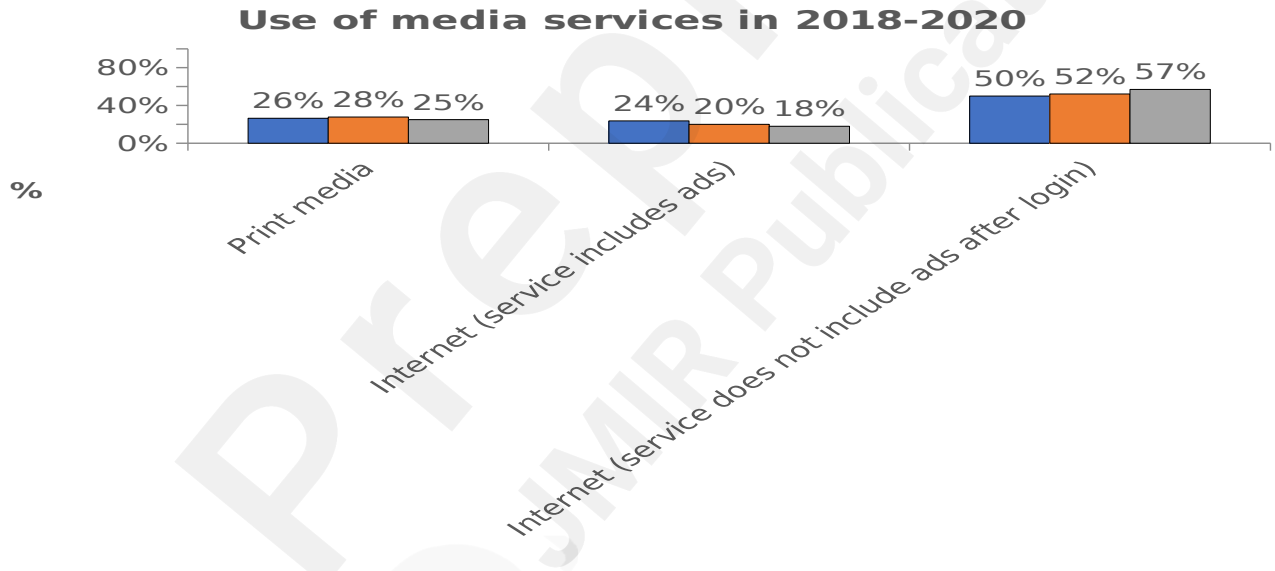


*Figure 1. How are the media you use at work distributed among the following options?*

## Social media

Social media channels seem to have established a strong, slowly growing adoption rates. The most frequently used social media was WhatsApp, which was used daily by 80% of the respondents, and monthly or more often by 89% of the respondents, with the annual growth of 2% in past two years. Similar slow growth trends can be seen in the use of YouTube and Facebook, which are all used monthly or more often by more than 60% of Finnish physicians. Instagram, Twitter and LinkedIn have much lower usage rates. The use of LinkedIn seems to be decreasing, as there was 28% of respondents using it monthly or more often in 2018, but only 13% in 2020.

Figure 2 summarizes the results, and shows the numbers used in analysing the statistical significance of differences between years. $\chi^2$-test shows no statistical significance between years in any of the usage frequencies (X2(10)=14,11, df=10, p=0,168).

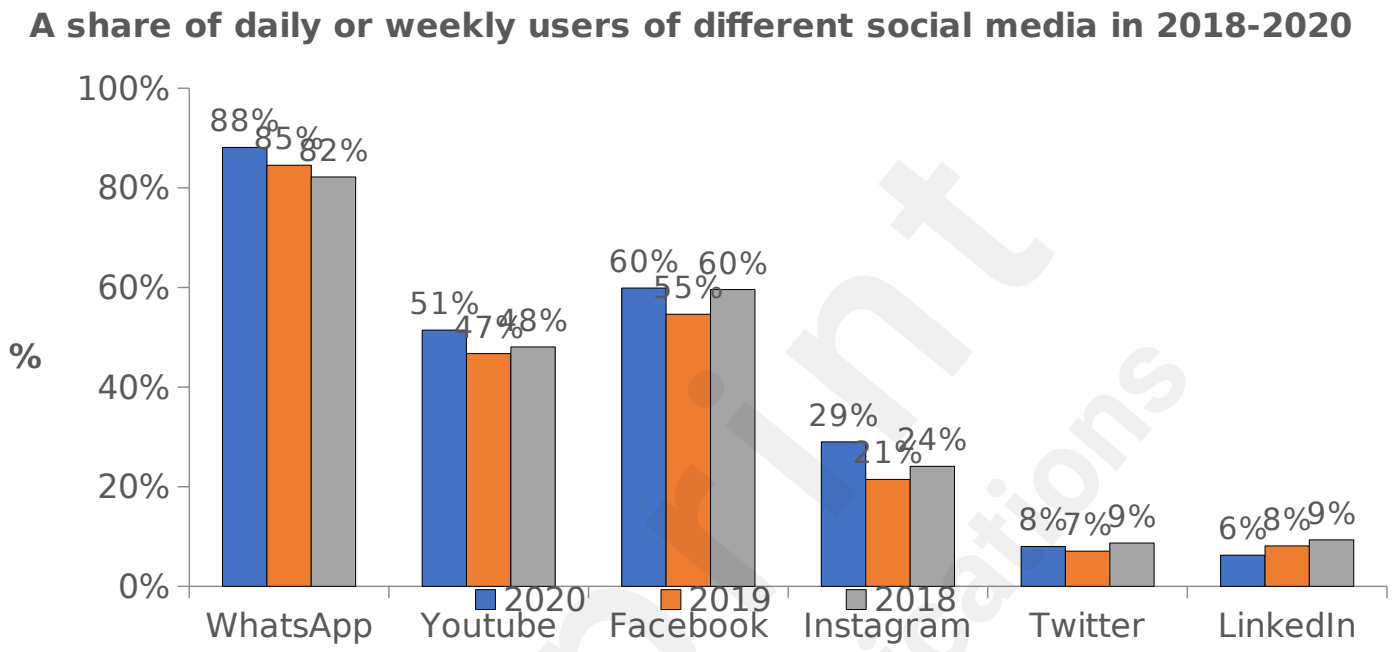


*Figure 2. How often do you use the following social media? A share of those, who use the social media daily or weekly.*

Majority of the respondents think that social media plays a small role in their work (see Figure 3). There was a significant relationship between yearly periods and yearly evaluation of the role of social media in the working context (X2(6)=27,50, df=6, p<0,001). The number of respondents who answer that social media has no role in their work has dropped from 28,8% in 2018 to 20,1% in 2020. However, the number of users who report that social media has a moderate role in their work increased from 15% in year 2019 to 25% in year 2020.

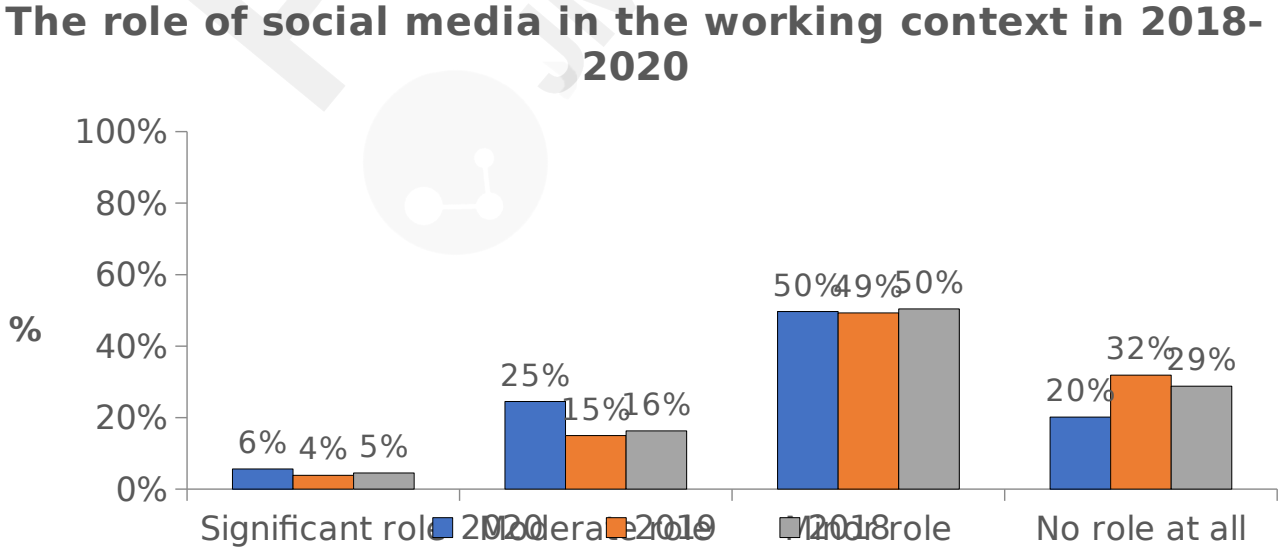


*Figure 3. Currently, what is the role of social media in your work?*

More than half of the respondents reported that they are members in private groups in social media to discuss work related topics (see Figure 4). The numbers of respondents participating have been growing. 36% of respondents were members of closed social media groups in 2020, whereas the number had been 25,4% in 2018. At the same time, number of respondents who show no interest towards joining social media private groups has decreased from 39,5% in 2018 to 28,7% in 2020. There was a significant relationship between yearly periods and the attitude towards private groups in social media in years 2018-2020 (X2(8)=22,80, df=8, p<0,05). However, the growth seems to be rather stable over the three-year period, with no noticeable increase in the numbers in 2020.

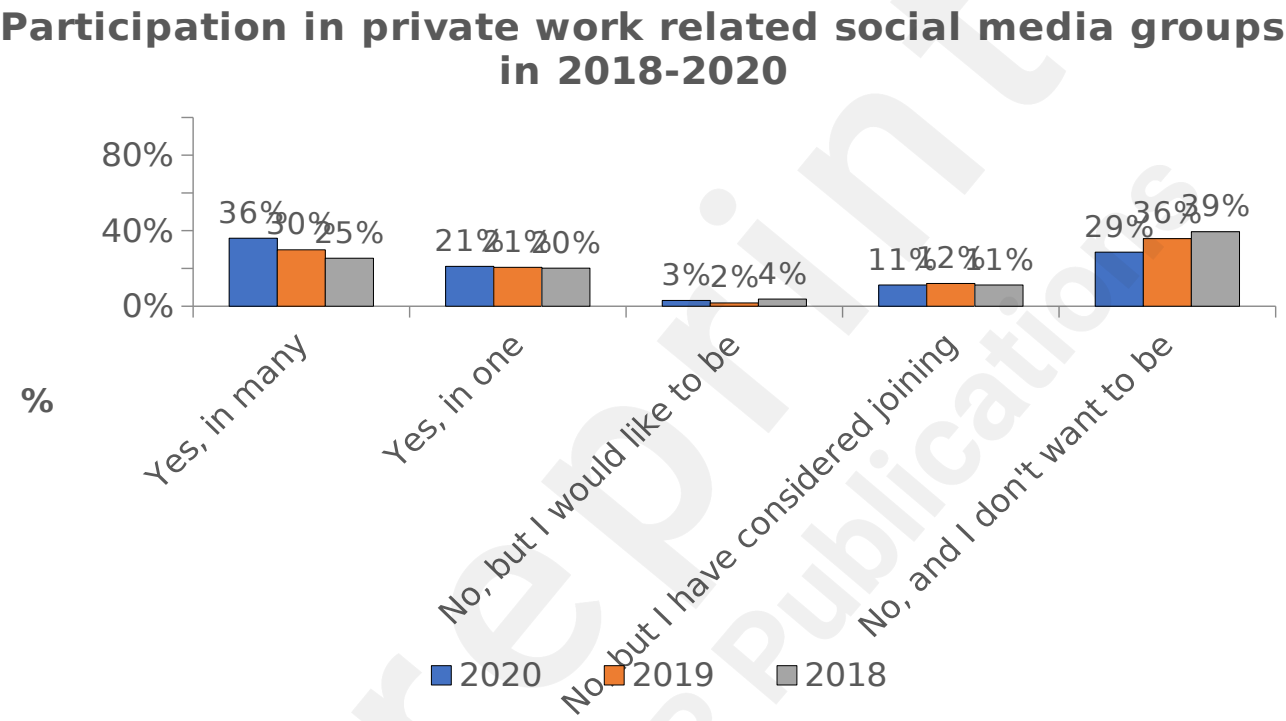


*Figure 4. Are you part of some private social media group where you can have a dialogue with other health care professionals about your work?*

## Participation in organized online events

The most significant changes in online media usage were seen in participation of online events (see Figure 5). We conducted $\chi^2$-test (Chi-squared test) to analyse, if yearly periods of time (2018, 2019, 2020) explain the number of respondents participated in organized online events. The question asked the respondents if they had participated in online trainings, online congresses or symposia, or eDetailing. The comparison was analysed within period of three years (2018-2020), between years 2018 and 2019, and between years 2019 and 2020. In addition, the relationship was analysed between yearly periods of time and all three types of organized online events combined in the same analysis.

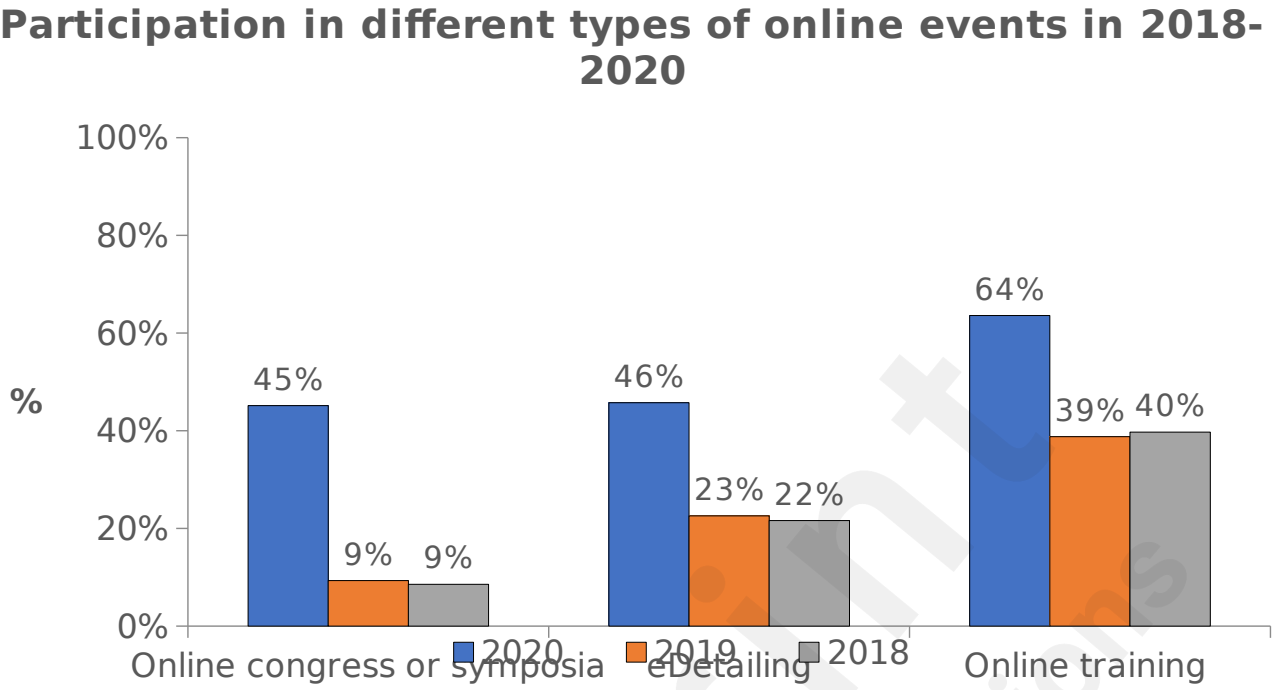


*Figure 5. Have you participated in the following types of organized events in the past year? The share of those who answered 'Yes'.*

There was a statistically significant change in all analysed online event groups over the three year period (eDetailing X2(2)=979,70, df=2, p<0,001, online congress or symposia X2(2)=1857,31, df=2, p<0,001, and online training X2(2)=411,58, df=2, p<0,001). Between year 2018 and 2019, there were no statistically significant change in the numbers, but statistically significant change was seen between years 2019 and 2020 in participation activity in all online event groups (eDetailing X2(2)=96,40, df=1, p<0,001, online congress or symposia X2(2)=263,21, df=1, p<0,001, and online training X2(2)=94,48, df=1, p<0,001). In addition, a significant change was identified between years 2019 and 2020 in participation rates when combining the numbers of all different online event groups together (X2(2)=101,17, df=4, p<0,001).

Interestingly, the attitudes towards participating remote online product trainings had changed into more positive in year 2020. The number of respondents reporting positive attitude has raised from 11% in 2019 to 22%, while the negative attitudes have dropped from the high of 44% in 2019 to only 18% in 2020 (see Figure 6).

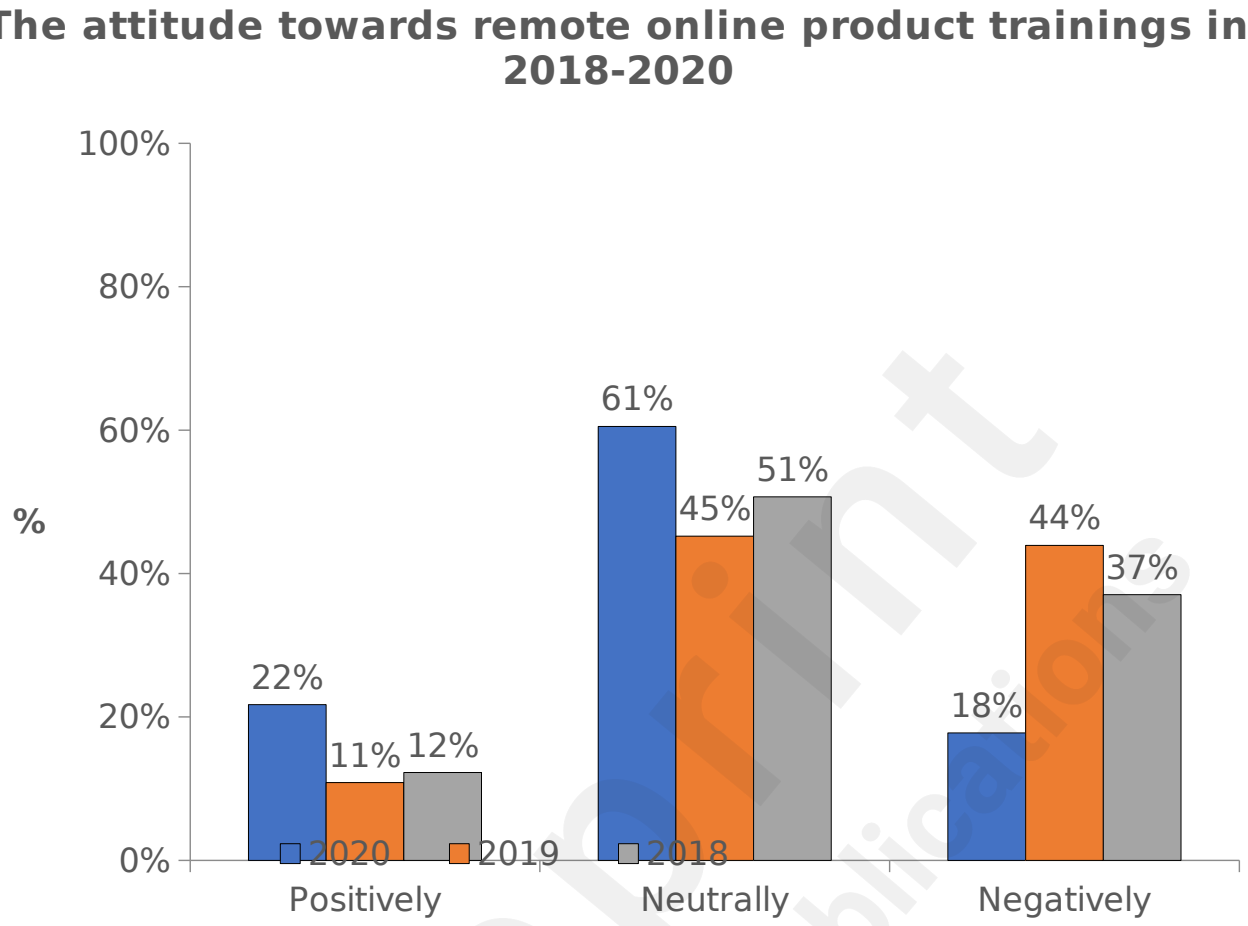


*Figure 6. How do you see the shift of product trainings from face-to-face personal/ group trainings to online remote trainings?*

When asked about reasons for positive attitude, three of the respondents specifically mentioned that it was a good option now because of Covid-19 related restrictions and special circumstances. Ten respondents mentioned time efficiency, four mentioned environmental issues, and four said it is as effective and useful as face-to-face participation.

## Discussion

Covid-19 pandemic has been expected to boost digitalization of healthcare. Our findings show that the use of online resources in information search of physicians in Finland has been on a high level already before Covid-19, and our results do not show increase in year 2020. The use of digital media continues to be high, and print media seems to be maintaining its role among Finnish physicians. Our results highlight that the use of social media is growing and increasing its importance among Finnish physicians. During recent years, social media has established itself as a viable work tool in healthcare. However, this growth has started already before Covid-19, and our results do not show significantly increased growth in 2020. However, our results do show growth that is statistically significant compared to the growth in previous year in Finnish physicians' participation of organized online events, such as online conferences, symposia, training and eDetailing.

Our findings indicate that the use of digital media for searching information and communicating in work context has been in steady rise among physicians in Finland. The use of web sites in information search is already at a very high level among Finnish physicians, following similar lines

as reported previously about use of online resources by Italian Neurologists (Demergazzi et al., 2020). The numbers were at a very high level already before year 2020 and Covid-19 special circumstances, and the use of web resources in information search remained in high level also in 2020. Interestingly, also print media stayed at the level of previous years, indicating that Covid-19 has not had an impact on Finnish physicians´ information searching practices. In Finland, the digital platforms providing access to latest care guidelines and databases of medical products seem to have a relatively established role in the everyday work of care professionals. Close to 90% of professionals report frequent use of digital media portals for accessing work related information, and Covid-19 does not seem to have a major effect in that.

Social media tools, such as instant messaging, private work-related group communication, and peer-created content, also have reached a high level of frequent use in the work-related communication and information sharing between Finnish healthcare professionals. Our results show that the use of social media among Finnish physicians has been on a steady rise already before 2020. There is an increase both in numbers of users and the frequency of use. However, this rise seems to be stable over years, with no significant difference in the rise in year 2020. The most used social media service was found to be WhatsApp, which has been found to be most used also among Italian physicians (Hazzam & Lahrech, 2018). Interestingly, the numbers of Finnish physicians who report using Twitter for work purposes was found to be rather low in our study, whereas it has been seen to be popular among healthcare professionals in some other contexts (Alsobayel, 2016; Pershad et al., 2018). The Finnish physicians seem to be establishing a more frequent use of social media in their work and free time, but according to our results, this trend has not been significantly impacted by Covid-19. Together with increased use, also the negative attitudes towards using social media for work purposes has decreased. The only social media platform that had decreasing use according to our results was LinkedIn. This might be because Covid-19 conditions are slowing down or hindering work related mobility in healthcare sector.

Our findings show that the biggest changes in digital media usage of Finnish physicians caused by Covid-19 can be identified in the participation in organized online events. There was a statistically significant increase between years 2019 and 2020 of number of physician’s who reported that they had participated in organized online events. Increase was seen in all three event types we examined. Physician’s had participated more in online congress or symposia, they had done more online training, and they had taken part in more eDetailing opportunities organized by pharma or other service providers. At the same time, we can also see an increase of positive attitude towards participating online events. This can be seen as an indication that the physicians’ experiences of participating had been positive, and they might be more willing to participate online events also in the future. As pandemic is forcing event organizers to adopt digital practices, it is likely that this creates opportunities to learn and develop practices that embrace the possibilities of virtual events in ways that can serve the medical community also in the post-Covid times (Porpiglia et al., 2020). It is likely that when mobility restrictions will be removed and physical events will be organized again, some of this increase might come down again as people most possibly do want to attend physical events. However, as there is also a positive change in attitude and more experience in arranging high-quality events through digital channels, we predict that this change can lead to more participation of online events also in the future.

## Conclusion

Our online survey of three-year usage patterns of digital media among Finnish physicians show that

digital media use has an established, strong role in work communication. Finnish physicians use online resources for their information needs, and social media to communicate about work related issues. The use of online resources for information search and social media have been growing steadily during recent years, and this growth has continued during 2020. There is no significant change in the growth numbers in 2020, indicating that Covid-19 has not had a big impact of use of digital media in information search, and participation in social media. However, our results show that the Finnish physicians have participated more organized online events than before. We claim that Covid-19 pandemic is an explaining factor of this change, as the event organizers have been forced to move to organizing online events because of mobility restrictions and social distancing. This has resulted in more availability of organized online events, and increased participation numbers. At the same time, the attitude of Finnish physicians towards online events has become more positive, which could indicate that the increase of online events might continue also after pandemic related restrictions.

## References

Aceto, G., Persico, V., & Pescapé, A. (2018). The role of Information and Communication Technologies in healthcare: taxonomies, perspectives, and challenges. In *Journal of Network and Computer Applications* (Vol. 107, pp. 125–154). Academic Press. https://doi.org/10.1016/j.jnca.2018.02.008

Alsobayel, H. (2016). Use of Social Media for Professional Development by Health Care Professionals: A Cross-Sectional Web-Based Survey. *JMIR Medical Education*, *2*(2), e15. https://doi.org/10.2196/mededu.6232

Brigo, F., Lattanzi, S., Giussani, G., Tassi, L., Pietrafusa, N., Galimberti, C. A., Bragazzi, N. L., & Mecarelli, O. (2020). A cross-sectional survey among physicians on internet use for epilepsy-related information. *Epilepsy Research*, *165*, 106393. https://doi.org/10.1016/j.eplepsyres.2020.106393

Demergazzi, S., Pastore, L., Bassani, G., Arosio, M., & Lonati, C. (2020). Information Needs and Information-Seeking Behavior of Italian Neurologists: Exploratory Mixed Methods Study. *Journal of Medical Internet Research*, *22*(4), e14979. https://doi.org/10.2196/14979

Eysenbach, G. (2004). Improving the quality of web surveys: The Checklist for Reporting Results of Internet E-Surveys (CHERRIES). In *Journal of Medical Internet Research* (Vol. 6, Issue 3, p. e34). Journal of Medical Internet Research. https://doi.org/10.2196/jmir.6.3.e34

Giunti, G., Claes, M., Dorronzoro Zubiete, E., Rivera-Romero, O., & Gabarron, E. (2020). *Analysing Sentiment and Topics Related to Multiple Sclerosis on Twitter*. https://doi.org/10.3233/SHTI200294

Golinelli, D., Boetto, E., Carullo, G., Landini, M. P., & Fantini, M. P. (2020). *How the COVID-19 pandemic is favoring the adoption of digital technologies in healthcare: a rapid literature review*. https://doi.org/10.1101/2020.04.26.20080341

Hazzam, J., & Lahrech, A. (2018). Health care professionals' social media behavior and the underlying factors of social media adoption and use: Quantitative study. *Journal of Medical Internet Research*, *20*(11), e12035. https://doi.org/10.2196/12035

Heponiemi, T., Hyppönen, H., Kujala, S., Aalto, A. M., Vehko, T., Vänskä, J., & Elovainio, M. (2018). Predictors of physicians' stress related to information systems: A nine-year follow-up survey study. In *BMC Health Services Research* (Vol. 18, Issue 1, pp. 284–284). BioMed Central Ltd. https://doi.org/10.1186/s12913-018-3094-x

Hornmoen, H., Fonn, B. K., Hyde-Clarke, N., Hågvar, Y. B., Hyde-Clarke, N., & Tana, J. (2020). 9. Rate

Your Health: Finnish Online Media Reports of Digital Innovation in Healthcare. In *Media Health* (pp. 186–203). Universitetsforlaget. https://doi.org/10.18261/9788215040844-2020-10

Keesara, S., Jonas, A., & Schulman, K. (2020). Covid-19 and Health Care's Digital Revolution. *New England Journal of Medicine*, *382*(23), e82. https://doi.org/10.1056/nejmp2005835

Kritz, M., Gschwandtner, M., Stefanov, V., Hanbury, A., & Samwald, M. (2013). Utilization and perceived problems of online medical resources and search tools among different groups of european physicians. *Journal of Medical Internet Research*, *15*(6), e122. https://doi.org/10.2196/jmir.2436

Lavorgna, L., Lanzillo, R., Brescia Morra, V., Abbadessa, G., Tedeschi, G., & Bonavita, S. (2017). Social Media and Multiple Sclerosis in the Posttruth Age. *Interactive Journal of Medical Research*, *6*(2), e18. https://doi.org/10.2196/ijmr.7879

Pérez-Escoda, A., Jiménez-Narros, C., Perlado-Lamo-de-Espinosa, M., & Pedrero-Esteban, L. M. (2020). Social Networks' Engagement During the COVID-19 Pandemic in Spain: Health Media vs. Healthcare Professionals. *International Journal of Environmental Research and Public Health*, *17*(14), 5261. https://doi.org/10.3390/ijerph17145261

Pershad, Y., Hangge, P., Albadawi, H., & Oklu, R. (2018). Social Medicine: Twitter in Healthcare. *Journal of Clinical Medicine*, *7*(6), 121. https://doi.org/10.3390/jcm7060121

Pesälä, S., Virtanen, M. J., Mukka, M., Ylilammi, K., Mustonen, P., Kaila, M., & Helve, O. (2019). Healthcare professionals' queries on oseltamivir and influenza in Finland 2011-2016—Can we detect influenza epidemics with specific online searches? *Influenza and Other Respiratory Viruses*, *13*(4), 364–371. https://doi.org/10.1111/irv.12640

Porpiglia, F., Checcucci, E., Autorino, R., Amparore, D., Cooperberg, M. R., Ficarra, V., & Novara, G. (2020). Traditional and Virtual Congress Meetings During the COVID-19 Pandemic and the Post-COVID-19 Era: Is it Time to Change the Paradigm? In *European Urology* (Vol. 78, Issue 3, pp. 301–303). Elsevier B.V. https://doi.org/10.1016/j.eururo.2020.04.018

Shiferaw, K. B., & Mehari, E. A. (2019). Internet use and eHealth literacy among health-care professionals in a resource limited setting: a cross-sectional survey . *Advances in Medical Education and Practice*, *Volume 10*, 563–570. https://doi.org/10.2147/amep.s205414

Slevin, P. J., Kessie, T., Slevin, P., Kessie, T., Cullen, J., Butler, M. W., Donnelly, S. C., & Caulfield, B. (2019). Exploring the barriers and facilitators for the use of digital health technologies for the management of COPD: a qualitative study of clinician perceptions. *An International Journal of Medicine*, *113*(3), 163–172. https://doi.org/10.1093/qjmed/hcz241

Smart, M. H., Mandava, M. R., Lee, T. A., & Pickard, A. S. (2021). Feasibility and acceptability of virtual academic detailing on opioid prescribing. *International Journal of Medical Informatics*, *147*, 104365. https://doi.org/10.1016/j.ijmedinf.2020.104365

Värri, A., Tiainen, M., Rajalahti, E., Kinnunen, U.-M., Saarni, L., & Ahonen, O. (2020). The Definition of Informatics Competencies in Finnish Healthcare and Social Welfare Education. *Studies in Health Technology and Informatics*, *270*(Digital Personalized Health and Medicine), 1143–1147. https://doi.org/10.3233/SHTI200341

Appendix 1. CHERRIES description of survey (Eysenbach, 2004)

| Category | Checklist item | Explanation |
|---|---|---|
| Design | Describe survey design | Survey was targeted for physicians in Finland. The sample was gathered from Success Clinic's physician register. |
| Institutional review board approval and informed consent process | IRB approval | The research follows the ethical guidelines of ethics committee of Human Sciences at University of Oulu (Eudaimonia) |
| | Informed consent | The participants were informed the length of the survey within invitation letter. The consent to analyse data was given when responding the survey. The data were stored in data secure database, which requires passwords from users. The investigator was Success Clinic. The purpose of the study was to gather opinions from physicians. |
| | Data protection | No personal information was collected. The aggregated results were stored in company's data secure database, and access to data is not possible without passwords. |
| Development and pre-testing | Development and testing | The survey was developed and tested by researchers working in Success Clinic. |
| Recruitment process and description of the sample having access to the questionnaire | Open survey versus closed survey | The survey was a closed survey. |
| | Contact mode | The participants were contacted via email, and individual access to survey was abled. |
| | Advertising the survey | The survey was not advertised. The invitation was sent for all individuals of the register. |
| Survey administration | Web/e-mail | The invitations were sent via email. The responses were entered manually by each participant, and the responses were saved to the database. |
| | Context | The survey was not posted on any |

| | | |
|---|---|---|
| | | website. |
| | Mandator/voluntary | The survey was voluntary, receivers of invitation had a choice to answer or not. |
| | Incentives | No incentives were offered. |
| | Time/Date | The data were collected in years 2018, 2019 and 2020. |
| | Randomization of items or questions | The items were not randomised, the order was the same for each participant. |
| | Adaptive questions | The questions were not adaptive. |
| | Number of items | 27 items. |
| | Number of screens (pages) | 9 pages. |
| | Completeness check | The completeness was checked from database by each response of the survey. Some questions were mandatory. |
| | Review step | The respondents were able to review and change their answers using 'Back' button in each page of the survey. |
| Response rates | Unique site visitor | N/A |
| | View rate (unique survey visitors/unique site visitors) | N/A |
| | Participation rate (unique visitors who agreed to participate/unique first survey page visitors) | N/A |
| | Completion rate (users who finished the survey/users who agreed to participate) | Total number of responses was approximately 3% of the physicians the invitation was sent to. |
| Preventing multiple entries from the same individual | Cookies used | The link for the survey was available for each participant only once. If someone would try to answer again, the system informs, that individual access was already used. |
| | IP check | Duplicate entries were not possible, see before. |
| | Log file analysis | - |
| | Registration | See before. |
| Analysis | Handling incomplete | All responses were analysed. |

| | | |
|---|---|---|
| | questionnaires | |
| | Questionnaires submitted with an atypical timestamp | - |
| | Statistical correction | No statistical correction was used. |

Appendix 2. Demographics from the 2018 survey.

| Demographics in 2018 | |
|---|---|
| **Age group** | **Share** |
| 18-29 years | 4 % |
| 30-39 years | 21 % |
| 40-49 years | 23 % |
| 50-59 years | 27 % |
| 60-69 years | 20 % |
| 70 years or more | 4 % |
| **Gender** | **Share** |
| Male | 39 % |
| Female | 61 % |
| **Area** | **Share** |
| Helsinki | 17 % |
| Uusimaa (not Helsinki) | 15 % |
| Pirkanmaa | 13 % |
| Varsinais-Suomi | 11 % |
| Pohjois-Pohjanmaa | 10 % |
| Pohjois-Savo | 8 % |
| Keski-Suomi | 6 % |
| Päijät-Häme | 4 % |
| Vaasa | 3 % |
| Satakunta | 3 % |
| Etelä-Karjala | 2 % |
| Etelä-Pohjanmaa | 2 % |
| Kanta-Häme | 2 % |
| Lappi | 2 % |
| Kymenlaakso | 2 % |
| Etelä-Savo | 1 % |
| Pohjois-Karjala | 1 % |
| Itä-Savo | 1 % |
| Kainuu | 1 % |
| Keski-Pohjanmaa | 0,4 % |
| Länsi-Pohja | 0,4 % |
| **Place of practice** | **Share** |
| University Hospital | 28 % |
| Health center | 23 % |

| | |
|---|---|
| Private practice | 21 % |
| Central Hospital | 16 % |
| Other | 8 % |
| Other hospital (former regional hospital) | 7 % |
| Occupational health center | 6 % |
| **Specialty** | **Share** |
| General medicine | 17 % |
| Specializing (also select field) | 16 % |
| Non-specialized | 9 % |
| Dentistry | 8 % |
| Psychiatry | 6 % |
| Anaesthesiology and intensive care | 5 % |
| Occupational health care | 5 % |
| Pediatrics | 4 % |
| Internal diseases | 4 % |
| Orthopedics and traumatology | 4 % |
| Geriatrics | 3 % |
| Gynecology and childbirth | 3 % |
| Neurology | 2 % |
| Ear nose and throat diseases | 2 % |
| Adolescent psychiatry | 2 % |
| Radiology | 2 % |
| Eye diseases | 2 % |
| Child psychiatry | 2 % |
| Lung diseases and allergology | 1 % |
| Cancers | 1 % |
| Gastroenterological surgery | 1 % |
| Bachelor of medicine | 1 % |
| Rheumatology | 1 % |
| Urology | 1 % |
| Acute medicine | 1 % |
| Physiotherapy | 1 % |
| Pediatric neurology | 1 % |
| General surgery | 1 % |
| Pediatric surgery | 1 % |
| Cardiac and thoracic surgery | 1 % |
| Endocrinology | 1 % |
| Pathology | 1 % |
| Health care | 1 % |
| Skin diseases and allergology | 1 % |
| Neurosurgery | 1 % |
| Vascular surgery | 1 % |
| Foniatria | 0,3 % |
| Cardiology | 0,3 % |
| Clinical physiology and isotope medicine | 0,3 % |
| Clinical hematology | 0,3 % |

| | |
|---|---|
| Clinical neurophysiology | 0,3 % |
| Plastic surgery | 0,3 % |
| Oral and maxillofacial surgery | 0,3 % |
| Gastroenterology | 0,2 % |
| Clinical microbiology | 0,2 % |
| Sports medicine | 0,2 % |
| Forensic psychiatry | 0,2 % |
| Hand surgery | 0,1 % |
| Nephrology | 0,1 % |

Appendix 3. Numbers used in $\chi^2$-test (Chi-squared test)

Table: Numbers used in Figure 2

| | 2018 Daily-Weekly | 2018 Daily - Monthly | 2019 Daily-Weekly | 2019 Daily - Monthly | 2020 Daily-Weekly | 2020 Daily - Monthly |
|---|---|---|---|---|---|---|
| WhatsApp | 503 | 516 | 339 | 345 | 400 | 405 |
| Youtube | 286 | 410 | 185 | 258 | 233 | 339 |
| Facebook | 342 | 360 | 219 | 235 | 273 | 290 |
| Instagram | 126 | 145 | 79 | 100 | 131 | 158 |
| Twitter | 44 | 62 | 25 | 40 | 35 | 62 |
| LinkedIn | 50 | 98 | 30 | 60 | 28 | 57 |

Table: Numbers used in Figure 3

| Role of social media in my work | **2018** | **2019** | **2020** |
|---|---|---|---|
| Small role | **322** | **204** | **229** |
| No role at all | **184** | **132** | **93** |
| Moderate role | **104** | **62** | **113** |
| Significant role | **29** | **16** | **26** |
| Total | 639 | 414 | 461 |

Table: Numbers of respondents, see % in Figure 4.

| **Participation in closed social media groups** | **2018** | **2019** | **2020** |
|---|---|---|---|
| **No, I do not want to** | **253** | **146** | **133** |
| **Yes, in several** | **163** | **122** | **167** |
| **Yes, one** | **129** | **84** | **98** |
| **No, but I have been considering joining** | **72** | **49** | **52** |
| **No, but I would like to** | **24** | **7** | **14** |
| Total | 641 | 408 | 464 |

Table: The number of respondents, see % in Figure 5.

| Participation in organized online events | 2018 | 2019 | 2020 |
|---|---|---|---|
| Online congress or symposia | 923 | 922 | 658 |
| Yes | 79 | 86 | 297 |
| eDetailing | 930 | 918 | 658 |
| Yes | 364 | 207 | 301 |
| Online training | 917 | 918 | 659 |

| | | | |
|---|---|---|---|
| Yes | 364 | 356 | 419 |

Table: The number of respondents, see % in Figure 6.

| | 2020 | 2019 | 2018 |
|---|---|---|---|
| Positively | 94 | 42 | 78 |
| Neutrally | 261 | 175 | 323 |
| Negatively | 77 | 170 | 236 |