DOI: 10.35191/medsoft_2021_1_33_93_103

BENEFITS AND LIMITS OF EHEALTH COMMUNICATION AT TOOLS GP'S

Ludmila Bernotová

Abstract

Digitalization of healthcare is logical consequence of technology infiltration into all fields of human activity. eHealth development offers new solutions for remote physician-patient interaction. The aim of this work is to explore which communication eHealth tools general practitioners (GP) currently use for patient consultations and to analyze their benefits and limits. Systematic literature review was performed to collect the evidence on eHealth communication tools impact on GP's workload, system security, health risks and user's perception of the consulting technology. Secure portals and chat-bots provide the highest potential to decrease the workload and provide the most secure consultation environment. Health risks are higher when the communication channel is not integrated to the patient's electronic health record. Patients' perception of communication media in the primary care is overall more positive than GPs'.

1 Introduction

Communication between healthcare professional and patient is a key component of provided healthcare [1]. Traditionally, face-to-face communication has been used for physician-patient interaction. However, technological development over the past decades have opened new communication tools often occurring outside of the clinical settings, as for example online video, social media and smart phone application [2-6]. Distant physician-patient consultations supported by Information and Communication Technologies (ICT) is a distinct part of eHealth development which has become to be viewed as a worldwide trend including Czech Republic [5, 7, 8].

Remote consultancy is one of the objectives in The Czech National eHealth Strategy, in order to help increase citizens' insight in their own health [8]. eHealth communication is also often considered as a way to improve chronic diseases management [9], increase healthcare access in rural areas [10], and to assist in emergency situations, particularly in the context of epidemic events [11,12]. Increasing usage of ICT in healthcare has raised questions about its impact on physicians' workload and data security [4,13]. Also concerns have been expressed that remote consultations may have been clinically risky and less acceptable to patients [6]. However, nowadays we are seeing proactive approach towards online consultations usage due to the ongoing coronavirus outbreak – healthcare professionals are globally encouraged to provide remote services [14], which could be seen as an opportunity to get ample evidence of the eHealth value.

General medicine is closest to patients in terms of local, temporal, economic and cultural accessibility [15] and therefore integrated healthcare supported by eHealth requires foremost full involvement of general practitioners (GPs) in the primary care. Therefore, the aim of this diploma thesis is to evaluate the performance of eHealth communication tools used by general practitioners in the Czech Republic and in selected EU countries. Firstly, to map eHealth communication tools currently used by general practitioners in the Czech Republic and in selected EU countries and discuss their benefits and limits. Secondly, the aim is to evaluate the impact of these tools on quality and availability of healthcare in the Czech Republic and to suggest possible alternatives to system changes in the research topic.

2 Methods

The author followed the systematic review process recommended by Brereton et al [16]. Firstly, the research questions were specified and consulted with Prof. Jarmo Reponen, M.D., Ph.D., an acting professor of healthcare information systems at University of Oulu (Finland) during March 2019. Regarding each evaluated criteria (namely GP's workload, the system data security, risk for patients' health resulting from miscommunication and user's perception of delivered care) specifying sub-questions were set.

The process of review conduction was initiated using databases of Web of Science, Science Direct, SpringerLink and the University Library of Oulu between April and June 2019. An initial electronic literature search was performed to identify the current standards for electronic communication between GP and a patient. To ensure comprehensiveness of performed systematic review, the tool "cited-by" tools to identify all relevant articles. Furthermore, secondary search was performed also by using additional web-search on Google Scholar and through searching specific oriented websites of national health authorities and providers of online consultation platforms, in order to ensure the retrieval of a comprehensive list of all eHealth communication tools available to GPs. The critical appraisal was performed and only studies focused on European countries general practice were used. Inclusion criteria included English-language, full text availability and communication exchange between GP patient, with focus on articles published after 2015 (not exclusively).

3 eHealth communication tools evaluation

Evaluated eHealth communication tools include electronic mail, online video, mobile messaging, social media and conversational agents or chatbots empowered with Artificial Intelligence (AI). Evaluation of benefits and limits is made from following perspectives: (1) its impact on GP's workload, (2) system security and protection of communicated data, (3) health risks and (4) patients' perception of each medium.

3.1 Electronic mail

This sub-section summarizes findings on benefits and limits that are affecting the use of email consultations in primary care.

Effect on workload. Workload impact resulting from providing email consultations in general practice is not consistently reported in literature. Surely, the volume of messages always plays an important role [17]. Number of non-essential emails can generate more work and additional consultations for a GP [18]. However, the administration of non clinical enquiries can be shifted to primary care nurse [17, 19, 20]. In order not to distract a GP with administrative like messages, some practices had two different mail boxes, one for medical information and one for the office management (appointments, schedules) [19]. Emails can particularly reduce number and length of telephone consultations [17,19,21-23]. However, reduced number of telephone consultations correspond to the increased number of email consultations and therefore the overall number of GP-patient interactions remains the same [23]. In contrary to telephone communication, email provides self documentation [24, 25] and allows GP to create templates for frequently asked questions [19]. GP can also use some reliable internet links in order to support the enquiry answer and doesn't need to type every single reply [24]. Closer evaluation of electronic mail impact on GP's workload requires distinguish the type of electronic mail. Professional secure portals offering EHR links save the consul-

tation content automatically in the patient's record [17,26-30], furthermore consultations through some secure-platforms can be conducted in form of structured questionnaires [20, 24, 27, 29]. Structured formats gathers information about a query which is sent as a report to the GP [26, 27, 31]. As opposed to consulting in unstructured free-text, the structured report facilitates the consultation assessment [17, 21, 24]. The length of evaluation per consultation in structured form takes about three minutes, which makes it approximately 3-times quicker than regular face-to-face appointment [17]. In some cases face--to-face visits were completely avoided after structured online consultation [17,21,24]. However, Carter et al. [29] didn't perceive any impact on the GP's workload, while Banks et al. [30] and Farr et al. [28] reported that most structured consultations resulted in GPs needing to follow up with a telephone or face--to-face appointment and therefore increased the amounts in work. In contrary, overall decrease in workload was reported in relation with unstructured free-text email consultations [19,21], as well as that it had no impact [18,32, 33].

System security. Privacy protection is offered by secure messaging through patient portals. Possibility to consult GP through nationally operating patient portals is determined with access to the national service. Access to the national patient portals requires multi-factor authentication, often including several separate pieces of evidence. Available ways of authentication use mobile authentication, online banking or governmental identifiers, electronic certificates and user ID with passwords [34-36]. Furthermore, national patient portals provide comprehensive users' support, such as help desks to address technical and navigation issues, or telephone and email contacts for addressing users queries [34,35]. Usually there are also materials available for people to educate themselves on safe online behavior and security matters [36]. Similar level of data security is applied to private suppliers' portals, because they have to be compliant with local policies and regulations as same as national portals [35,37]. Regarding the consulted data accessibility, the common approach is to allow citizens visibility of their data, as well as to health professionals they treat them [35,36]. Further, users can report any suspicious behavior seen regarding their patient's or professional profile [36]. In like manner for secure portals and conventional emails citizens control their own log [34,38]. However conventional emails don't provide users authentication and therefore patient is not fully identifiable. Furthermore, personal emails aren't necessarily encrypted and aren't integrated to EHR systems. Users of conventional emails can perceive lack of guidance and users' support. [18, 38]

Health related risks. Safety concerns in case of structured consultations, as well as in conventional email [18, 26, 28, 30]. Primary care staff mentions typing-like consultancy can lack the contextual information compared to face-to-face communication or even phone calls, which can make correct interpretation of the messages more difficult [21,30]. However, lack of information at the secure portals can be substituted by linking the portal to the patient's record, where GP can check all the health data on the concrete patient [17, 29]. Concerns however differ for consulting via free-text or queries with structured questionnaires. Quality of electronic consulting using free-text (as regular email) can be dependent on the patient's ability to express themselves [21]. Structured queries can provide more detailed history than a free-text tool, because they can be thematically framed. Structuring also helps in consistent history taking, where questions aren't missed or forgotten.[39] Receiver of conventional emails cannot always confirm the patient has received their email response that might contain important information [18, 29]. On the other hand, when consulting medium incorporated to clinical system, the responds has to be given within a stated timeframe [17]. Structured online forms can even respond in real time [17, 27] and users are notified in case of contact out of opening hours that their request will not be processed until the next working day. Email consultations or secure messaging are mostly used for non urgent follow-up of issues previously discussed during in-visits, as for example for adjusting a treatment, prescribe referrals or provide results of laboratory tests [21, 40]. To avoid healthy risks, Norwegian PHR portal set up exact requirements for patients when remote consultation cannot not be used, including newly emerged clinical problems and sick leaves requests [21].

Patients' perception. Patients' perceive email as the most popular way of contact to services [17, 19, 24, 41]. Regular emails with free-text windows provide easy and quick platforms for patients. They allow them to express for any problem, as well as any relevant thoughts or concerns of patient. This is not possible with tick-box questionnaires via structured consulting. Further, it can take longer to complete, which can deter some patients from using the tool [39]. Patients are especially comfortable with receiving laboratory tests results by electronic mail, but they are less willing to use this way of contact for more serious conditions such as receiving a brain computed tomography scan results. In general, patients are satisfied with secure messaging portals. Some patients even review their medical information recorded on a patient portal and request the GP to correct errors. Further, just as emails, secure messages can be convenient because patients can reread the message with instructions that they have received from their GP [27, 19]. On the other hand, patients' satisfaction with electronic mail can be lowered by not receiving answer in time [17, 21, 24, 27]. Patients' adoption of secure messaging via official healthcare portals is not consistently reported. Some studies claim that the level of use of secure portals is lower than using personal e-mail accounts to contact their GP. Especially because of the lack of information (patients don't know about the portal, don't know how to use it), lack of motivation, and negative attitude towards secure portals [26, 27]. Eccles et al. [26] observed both positive and negative perceptions of the same issues, suggesting that experiences of using the online platform were complex and relative to the patient and their characteristics, as well as the conditions in which the patient made the request.

3.2 Online video

Following chapter summarizes evidence on benefits and limits regarding video consultations in primary care.

Effect on workload. While evaluating workload resulting from providing video consultations, it is important to answer whether it replaces face to-face visits or it adds another activity to the workload. Video consultations can proceed like face-to--face appointments [43,44] and can reduce overall number of face-to-face contacts [42]. Workload resulting from potential additional face to face visits can be decreased by educating patients and nursery staff on which conditions are appropriate to discuss via Skype [43]. Patients who needed to consult simpler issues like medication reviews and blood test results can book only short video visit which avoids unnecessary time slots [43]. Some secure patient portals allow performing video consultation via this platform. Thereafter the documentation of performed video visit is reported in patient's EHR as checked and GP don't need to self-note its evidence [45, 47, 48, 51].

System security. A procedure to identify the patient has to be done before the video consultation in many systems. Methods of identifying users include use of telephone numbers, equipment of IP addresses, and user email addresses [42, 47-49]. As for example in local UK video Attend Anywhere webpage-based service, patients are emailed a secure web link with the date and time of their consultation. Following the link and log in with the name and telephone number, the link opens to a virtual waiting room showing the name of their GP [42]. When video consultations are planned in advance, it is considered safer regarding the system security [46]. Log to conventional online video software (e.g. Microsoft's Skype) is recommended by username instead of full name because Skype has an open access address book [46]. In this case GP always has to ensure that the patient's contact details including patients' username are up to date in their record [46]. Regarding the Skype software security, an independent security assessment was performed in 2005 (Skype Security Evaluation, 2005) [50] which concluded that Skype can verify user identity and content confidentiality between systems. The aspects of the Skype architecture and communication protocols, which use 'standards based' cryptography for authentication and confidentiality, appear to be implemented in a robust manner, as well as used algorithms. The Skype security model prevents anyone from interfering or capturing any part of a Skype communication. It also makes it very difficult for anybody to eavesdrop on content by installing an internet computer in the theoretical path of Skype traffic. However, complete anonymity or secrecy cannot be guaranteed. [46, 50]. Video consultations should not be recorded, unless the service user provides explicit consent to live recordings - if provided this should be noted in the EHR [50].

Health related risks. On the contrary to face-to-face consultations, video can rise question about the ability of the GP to perform an adequate physical examination [52]. Video consultations appear to be less 'information rich' for GP than face-to-face consultations [42]. In comparison to telephone-only consultations for decision making on health conditions, video proved benefits of better treatment decision making [49], resulting from facilitate understanding through non verbal communication compared to other remote consulting methods [39]. However this is dependent on the GPs ability to pick up on visual cues and carry out a visual examination when visual examination is important (e.g. assessment of inhaler technique) [42]. Necessity of diagnostics test during online video doesn't need to be problem – some commercial providers allow patients to have diagnostic tests carried out prior to their video consultation [39]. Video consulting is not appropriate for emergency calls or severely ill patients with comorbidities (e.g. confusion) affect the patient's ability to use technology [42, 46, 49]. Online video software usually lacks GP access to patients' EHR, with the potential for important information to be missed. The risk of liability stemming from a miscommunication or misunderstanding can be reduced by using two screens (or a split screen), when a GP can view Skype and the electronic patient record simultaneously [46]. Video consultations are highly dependent on good technical connection. If technical connection is high-quality, GPs and patients tend to communicate in much the same way as in a face-to-face consultation. The risks regarding appropriate timing of video consultation relies on the doctor and patient being available at the same time, hence may not be exempt from long waiting times or delays [39]. Patients and the practice require the right equipment with the appropriate IT infrastructure, to ensure the quality of the image to be very good in general and high enough quality for safe video consultations [39]. In case of lack internet connection, there should also be a backup option such as a telephone as the video quality is highly dependent on the internet connection [46].

Patients' perception. As resulting from 2019 survey in United Kingdom, the preferred method of remote visit was for 36 % of people by online video compared to other way or remote consulting [53]. Patients are satisfied with video visits as an alternative to in person visits, when loose of face-to-face contact is not considered to be a limiting factor [53, 54]. However, in United Kingdom patients revealed a much higher preference for secure messaging, telephone or face to face consultations compared to video (askmyGP data, 2019) [54]. A preference for telephone is also reflected in the recent evaluation of Babylon's GP at Hand Service [39]. Video visits are providing the patients a convenient way of consultation to their GP related to decreased travel costs and time save (cut of waiting time and no transportation needed), and some appreciating the comfort of being in their own environment [52,46]. Some patients appreciate the possibility to contact their GP via Skype from abroad, especially for medication reviews and queries about their test results [46]. Limiting factors for patients are concerning privacy issues, especially for those patients who connected to video visits in their workplace [52, 46]. People didn't see the advantage of video if they did not require the visual examination or even felt uncomfortable with it e.g. discussing sexual health problems [42].

3.3 Text messaging and messaging applications

Following chapter provides review of evidence on benefits and limits regarding textingused in the patient-physician interaction.

Effect on workload. GPs usually appreciate instant messaging mostly regarding time-saving management in contrast to consultations over calls [55,56]. The use of text messaging as opposed to phone calls is more efficient and may facilitate GPs with more time to address patients' needs [55]. Also study by Head et al. [57] concluded that SMS tailoring and personalization is associated with greater intervention efficacy, and therefore can reduce workload [57]. On the contrary workload can be increased, when patient opens a forum for ongoing discussion and therefore new questions to answer occurs for a GP [55]. While using instant messaging apps like WhatsApp, an integration with EHR was identified as a problem. Electronic and hardcopy records of communication can be made (e.g. from WhatsApp) including images and other attached files, ideally to a secure server. Thus, this process is not made automatically and it requires additional workflow. [61]. Modern messaging apps for HCP that are intended for clinical practice are linked to the GP's software. Software can then send messages automatically, as for example for appointments reminding a day before patient's planned visit. This can significantly reduce GP's workload and can help to the GP's office run on time with prescheduled visit and appointments [58-60].

System security. System security is extremely dependent on the concretely used communication channel. Identified risks related to using regular SMS texting include confidentiality and consent issues, as well as problems with incorrect phone numbers. Patients should agree on texting policy and accept the informed consent. The patients have to understand the benefits and limitations of text messaging (for example importance of advising their general practice when mobile numbers are changed). [55] Specific challenges can be faced while sending texts to young adults in the age 16-17 years old (often changing

mobiles). The content of a text message should be carefully considered, bearing in mind that the identification of the patient is never 100%, or that others may read the text. [59] Without using unique patient identifiers maintaining the confidentiality is problematic. De-identifying the concrete patient information makes knowing who is being discussed in a chat group difficult. Using minimal identifiers (e.g. patient initials) all the time allows possible identification. [61] Confidentiality risks occur also related to data privately stored on smartphones, and exchanged among closed messaging groups (e.g. on WhatsApp). If the pictures are forwarded to the wrong recipients; or if the photos are used for non-intended purpose to which the patient had consented. Measures to address confidentiality of patient data stored and exchanged via phones require smartphone security (e.g., data encryption and remote data wiping in case the stolen phone). [61] Clearly, text messaging alone is inappropriate for urgent or important messages [62].

Health related risks. Safety concerns have been raised regarding texting in general practice specifically related with messages for multiple patients in a chat messaging groups, where it can be difficult to identify to which patient the message referred [55]. Lack of punctuation in messages and used abbreviations can create ambiguous information that can be misunderstood [62]. Text of SMS may be too brief for a patient to understand sent information. Therefore, for example test results sent via SMS can mislead patients regarding 'normal results' or the opposite. This concern can be demonstrated on sending results from routine blood tests, when some patients can easily misunderstand the value between HDL and LDL cholesterol levels. [55]

Patients' perception. As resulting from United Kingdom survey in 2019 among three, the preferred method of access by messenger app is 19 %, when text message/SMS is preferred by 16 % of patients [53]. Most patients are happy to receive texts from their GP, especially appreciated is the advantage of receiving fast test results that's followed by providing effective patient reminders. As SMS message is sent directly to a patient's mobile phone, they are deemed as convenient and as easy to use as a smartphone communication apps, however Jenssen et al. [63] concluded that patients from low socioeconomic and minority ethnic groups are more likely to support the use of text messaging as a way of communication with their GP. The main limiting factor for patients is being unable to respond to web-generated text messages and worries regarding SMS confidentiality. [55]

3.4 Social Media

Following chapter investigates the benefits and risks resulting from social media application in the patient-physician communication.

Effect on workload. One of the most noted barriers why HCPs don't use social media while contacting their patients is the lack of time. For GPs it can be hard to incorporate the online tool into routine practice. In the same time other GPs can appreciate the social media advantage, by saving consultations time when instead of providing general information to patients by themselves, they use suitable social media. Using social media for patient education may in fact be a time-saving and a potential demand reducing option for patient care [3,64]. Impact on workload vary on the social media channel used, as well the purpose of its use. As for example online discussion forum for patients with asthma were found as a useful tool, but HCPs noted it takes time to log in and to instruct the patients. Also, the GPs found that the system has more functions than necessary and therefore this social medium increased their workload [65]. Social media are not linked with EHRs of patients, even this theoretical integration have been studied in the literature [66].

System security. No discussion of social media regarding the healthcare is complete without at least a mention privacy issues of these networks. The security among various social media vary a lot. Primary care staff should always assume that all information exchanged over social media are public and posted in a public medium. Even when a message is private (e.g. a direct message on Twitter or Facebook) this does not mean that the sent information is secure and protected. [67] Patient privacy on social media in contrast to face-to-face is dealing with the permanency of digital information. Closed, secure systems with data encryption can maximize the safety but attention should always be paid to the security, access, and permissions involved in any social media used in the health care delivery. Especially while using unsecure third-party open sites (e.g. Facebook, Twitter) postings, public or private message, may ultimately belong to the third party and security breaches have been known to occur. There have always been concerns related to the risks of breaching patient confidentiality and data protection requirements related to social media. There are also related ethical requirements (including patient consent) for using social media for health care delivery. Most reputable healthcare organizations have well-established and clear policies governing such clinician ethics and discipline issues as they use online environments including social media. [61] For example, a policy statement by the American College of Physicians has recommended HCPs not to contact patients through social networking sites [64]. This recommendation seems reasonable, considering social media posts can be created anonymously and therefore the HCP can never be sure about patient's identity [67].

Health related risks. Kovic et al. [68] performed a survey of medical bloggers and found that successful medically related blog writers are often university educated authors who are trustworthy to their information sources and motivated to influence readers by sharing their practical knowledge or skills [68]. However authors of medical information posts found on social media sites are often unknown or identified by limited information. This interactive environment of social media can magnify health issues, since any user can upload content to a site. Social media users may be vulnerable to conflicts of interest that they may be incapable of interpreting provided information. In any case of GP-Patient social media interaction, a HCP should avoid providing specific medical advice to non-patients and always should use appropriate disclosures and disclaimers regarding the accuracy, timeliness, and privacy of electronic communications. [67,70]

Patients' perception. Generally, the use of social media for healthcare purposes has increasing acceptance among patients [55]. Patients also seem to be more interested into social media use than their physicians, perhaps because they face fewer barriers to entry than media [3]. Compared to other electronic communication channels, patients are less interested in receiving information via social media than through email [71]. Some user may have a negative perception of using social media as it may be seen as inappropriate and unprofessional [64]. A survey of patients conducted in 2013 at a family practice clinic found that 56% of patients wanted their GP to use social media for reminders, for scheduling appointments, for diagnostic test results, as well for prescription notifications and answering general enquiries. Patients who did not use social media said they would start if they knew they could connect with their HCP. [67].

DOI: 10.35191/medsoft_2021_1_33_93_103

3.5 AI chatbots and Voice-driven Technology

Following chapter summarises evidence on benefits and limits regarding the conversational agents use in primary care.

Effect on workload. Considering GPs' workload, chatbots in the primary care setting as well voice driven intelligent bots can save valuable time and complete tasks like appointment scheduling, administering reminders for medication, treatment compliance, providing medication use or misuse instructions or answering medication frequently asked questions [73]. AI employed in symptom checkers can triage patients according their health and provide patient valuable answer. AI bots can be also very time-efficient in data collecting. As resulting from eCHAT evaluation by Goodyear-Smith [72], generally, staff found the way of screening to be simple, quick, and easy to use. They valued the way it facilitated patient engagement and the integration with the EHR. Overall, the time needed to identify problematic health issues is reduced, because the tool is self--administered by patient alone before the visit. [72].

System security. Healthbots must follow the same rules as any other medical software and pass privacy and security controls. Healtbots must be GDPR compliant to ensure the patient's personal information is safely received and stored. [76] Privacy and security issues are mostly related to voice driven chatbots, because anything that's said loud can be heard by someone else [73]. In contrast to other communication medium, AI chatbots can easily identify the patient, especially voice driven chatbots that have voice recognition ability that identifies the patient by using biometrics [76-78].

Health related risks. Artificial intelligence powered symptom checkers have the potential to provide diagnostic and triage advice with a level of accuracy and safety approaching that of human doctors [79]. Babylon's assessment is that their symptom checker outperforms the average human doctor on a subset of the Royal College of General Practitioners exam, a study in the Lancet concluded that the evidence of this impact is not convincing. However tools may vary in their outcomes. Further, patients might not accept self-care/pharmacy dispositions when delivered by a computer, and may fill out the form differently a second time or phone for an appointment. Then the risk that over-cautious implementation of red flags could increase unnecessary direction to urgent care. [77] Therefore, the risk of liability stemming from miscommunication or misunderstanding is low. The level of risk is decreased also because the online triage system where the patient enters the symptoms is directed to the right person or service in real-time (synchronous) [77].

Patients' perception. The consultation with a virtual GP would prefer only 7% of patients [53]. Patient perceptions of visiting their GP only after chatbot consultation is widely positive. A study conducted by global company Price-Waterhouse--Cooper (PwC) in 2017 found out that only 39 % of UK patients were comfortable with the idea of consulting with a computer employed by artificial intelligence. [80] This may be because of the perceived lack of quality or accountability that is characterized by computerized chatbots as opposed to traditional face to face interactions with human physicians [73]. Willingness of patients for AI consultations was higher in Netherlands (55%), Belgium (51%), Norway (50%) and Sweden. Lack of impersonality and inability to 'look beyond the data' were classified as disadvantages. [80] Some patients may feel that chatbots are safer to interact than human professionals and are willing to disclose more medical information and report honestly all medical symptoms. [75,76].

4 Results

Firstly this chapter presents key findings from performed systematic review. The findings are presented for each communication medium individually (Table 1 – Table 6). Evaluation of electronic mail impact on benefits and limits requires distinguish the type of electronic mail: conventional free-text typed or structured questionaries' available through secure portals.

Secondly this chapter presents summary of evaluated criteria in one summary table (Table 7).

Table 1: Benefits and limits of conventional free-text email:

	Benefits	Limits
Workload	Volume dependent	Volume dependent No EHR integration No time-saving
System security		No authentication No IT support
Health related risks	Possible to re-read	No safety measure, lack of context
Perception	Familiarity	Lowered by delayed reply

Table 2: Benefits and limits of secured messaging through patient portal:

	Benefits	Limits
Workload	Lowering number of contacts EHR integration Structured form	Volume dependent
System security	Authentication Robust IT support	
Health related risks	EHR integration	
Perception	Possible to re-read History access Given reply period	Less user-friendly

Table 3: Benefits and limits of online video:

	Benefits	Limits
Workload	Lowering number of contacts	Requires punctual appointments planning Usually no EHR integration
System security	Authentication and IT support in case of video via secured portals	Usually no authentication No IT support
Health related risks	Better decision	No safety measures
Perception	Convenient, time-saving	Not for acute issues Lack of privacy during the call

Table 4: Benefits and limits of text messaging:

	Benefits	Limits
Workload	Lowering number of contacts Increasing practice efficiency	Volume dependent No EHR integration No time-saving
System security		No authentication No IT support
Health related risks		No safety measure, lack of context
Perception	Effective reminders, easy results	Inability to respond, Confidential issues

Table 5: Benefits and limits of social media:

	Benefits	Limits
Workload	Educational purposes	No EHR integration No time-saving
System security		No authentication No IT support
Health related risks		No safety measure, lack of context
Perception		Confidential issues

Table 6: Benefits and limits of AI chatbots and Voice-driven Technology:

	Benefits	Limits
Workload	Automatic tasks completion EHR integration	Volume dependent No EHR integration No time-saving
System security	Authentication, biometrics IT support	Voice-driven tasks can be heard
Health related risks	Level of accuracy and safety of humans (red-flag notifications)	Recognition limited to preinstalled input
Perception	More open patients	Age and language barriers

Table 7: Summary of findings:

	Ordinary email	Secure portal	Online video	Messaging	Social media	AI
Workload	Questionable	Decreased	Decreased	Decreased	Questionable	Decreased
EHR integration	No	Yes	No	Depends	No	Yes
System security	No	Yes	Yes	No	No	Yes
Patient identification	No	Yes	Yes	No	No	Yes
Perception	Questionable	Low	Questionable	Questionable	Questionable	Low

5 Discussion

Discussion of benefits and limits in the structure of particular communication media for GP-patient interaction can serve as a comparison of various consultation platforms and can be valuable source for unresolved issues of future development of health services. The discussion of benefits and limits is performed from four studied impacts: on the GPs' workload, system security, healthy risks and users' perception. Inconsistent findings were yielded regarding the communication media effect on workload. As mentioned above, AI chatbots and voice-driven technology have clearly the potential to reduce GP's workload, as well as structured consulting, video calls and SMS reminders. On the other hand, GP can spend a great deal of time by managing free-text emails and social media, especially if considering subsequent follow-up as an additional task. However, there is unique finding reckoning that free-text communication could replace 2% of visits [81]. Similarly Dash et al. [19] perceived decrease in the workload while using free-text email. This could be due the fact that followed GPs offered two different mail-boxes, one for clinical and second for administrative issues manageable by nurse. Because lots of patient's requests are administrative related [26, 33]. What seems critical for workload evaluation is, if patient after remote consultation continued to contact GP by face-to-face, which might affect the aim of reducing the workload [25], and the remote service adds another activity to the workload or replaces existing GP's tasks. Furthermore, it is necessary to ensure that GPs' understand the IT technical shortcomings [25,82]. That is why Chudner et al. [83] suggest to engage stakeholders into innovation implementation and ensure the system user-friendliness.

As resulting from presented findings, workload impact and system security strongly depends on the IT infrastructure used. However, little has been reported on technical characteristics in reviewed studies regarding GP-patient interaction. These concepts are often beyond the technical expertise of clinical researchers that focus mostly on acceptability, benefits, and challenges of remote consulting from patients' and clinicians' views, rather than technical evaluation. Williams et al. [84] supports finding of this thesis, that lowest secure communication platform is among social sites, as opposed to secure portals, where authentication process is often as safe as for online banking [35,36] and chatbots with biometric security measures [78]. A system allowing retrieval of patient's identity reduces the medical and legal risks of remote consultancy [35], because lack of proper patient identification increases consequent potential for error in clinical decision making [85]. Every practice should be compliant with the general data protection regulations (GDPR) that came into force on May 2018, however finding of this thesis suggests that in case when there is no secure medium, GPs use unprotected email system to communicate with patients [86, 81]. Despite this fact and GDPR recommendations, the percentage of GPs who is discussing confidentiality issues in relation to unprotected remote communication with their patients is not reported in studies included in presented review. However, recent recommendation of NHS England suggests, that in emergency situations, the data protection is only secondary matter and GPs can use tools such as Skype, WhatsApp and Facetime, if its considered as a short-term measure caused by emergency situation [87].

The author finds a correlation between impact on workload and the potential health risks. Communication platform which is not integrated with the EHR increases the physician's registering load and involves extra work, as well as is risky regarding the patients' safety. Castrén [81] found that more than 70% of physician-patient email contacts were not documented in the EHR. However, comprehensive EHR containing all health-related patients' information was found to be important to ensure patients' safety [87]. Therefore, communication media linked to patients' EHR are perceived as more safe. Health risk is also affected by the nature of communication tool itself. Even though there is little evidence published by JAMA Internal Medicine in May 2016, saying that remote consultancy provide the same level of opportunity as a physical visit [88], author of this thesis finds differences between patient's safety ensured during face-to-face visit and its remote alternatives. For various previously presented reasons, standalone unstructured texting does not meet the requirements to provide consultation avoiding unwarranted variation in quality [38, 28, 30]. The risk occurs especially, if social media or mobile messaging would be used for clinical decision making. Finding of this thesis leads to strong consideration that social media can be a powerful tool for public health information dissemination, but at the same time it can contain loads of misinformation [89]. Similarly SMS can be too short to cause misunderstanding or can easily be sent to wrong telephone number [19,43].

Author of this thesis found that GPs differ in their technology perception and uptake rates in contrary to patients. The higher acceptance of technology was found by patients. This finding is consistent with other studies, as for example with Chudner et al. [83]. Despite the available evidence claiming potential benefits resulting from technology implementation, there is a general reluctance among GPs to implement alternatives to face-to-face consultations [28,30,41]. Overall, GPs preferred the asynchronous ways of communication for its decreasing impact on the workload and flexibility [17, 19, 25,27]. The potential to decrease workload was cited especially in the context of structured consulting [17,27,20]. This finding is in accordance with Dyer-Smith and Badial [90], finding 87% of structured consultations didn't need any follow up, if GP was properly trained on consultation model. Disadvantages for using remote consultations included concerns regarding the patient's security, potential workload increase [25,28,30], lack of data protection [4, 26] and guidance [18]. The main findings regarding the patient's perceptions are, overall, highly positive, which is in accordance with previous studies [91]. Similarly like GPs, patient's preferences also revealed higher for electronic mail compared to video [33,42]. Reasons underlying this satisfaction include enhanced convenience, reduced cost and waiting time [17,21]. However, there were also clear grounds for dissatisfaction, particularly with care delivered by the personal email when patients don't receive follow-up in time [26,92]. Almost three out of four responders stated that availability of online access would influence their move to another practice [91], nonetheless, responders were reluctant to award a high monetary value to it. Furthermore, patients' satisfaction is highly dependent on the patient and their characteristics, as well as the health conditions in which the patient made the request [22,26].

6 Conclusion

An effective communication between GP and a patient is a key factor healthcare quality anywhere in the world. Nowadays, also in the context of COVID-19 outbreak a phenomenon of remote consultancy has been gaining on importance. However, there are certain aspects why this alternative way of working is not widespread and implemented among general practices. Reasons for slower implementation of eHealth communication often contain GPs' worries of increased workload, not sufficient protection of sensitive data and decreased ability to perform save clinical decision during remote consultation. Furthermore, users of such a technology often perceive barriers to consult

their health remotely. With regard to cited concerns, this thesis aimed to evaluate benefits and limits of the eHealth tools GPs can use for communication with their patients. Completely five communication tools have been described and evaluated by systematic literature review with help of an extensive analysis of 41 studies. The impact on the quality and availability of provided healthcare has been assessed for each of the mentioned tool and final summary of key findings regarding benefits and constraints has been provided. In order to confirm the aim of the thesis, it was concluded that secure portals and chatbots are the most favorable tools to increase quality and availability of the primary care and they should be used in the near future, not only thanks to the international trends observation, but mainly in regard to the performed analysis of the tool's benefits a limits. Having defined results of performed analysis, the author is able to answer set of research questions. Regarding the first research question assessing the impact on the GP's workload, the potential of decreasing have online structured consultancy through secure portal, video, text messaging and a chatbot. Second question tend to evaluate the privacy protection of consulted information. It was found the highest when secure portal, video or chatbot is used as a consultancy medium.

Third research question was observing the clinical risk steaming from miscommunication or misunderstanding, which was found the highest through conventional email, mobile messaging and social media. The last research question on users' perception cannot be definitely addressed on which communication medium is the best perceived. However patients are generally more willing to consult remotely, than GPs. And finally, all asynchronous communication media were better perceived than video. On top of these conclusions, the thesis compared the international status of eHealth implementation with the Czech environment and finally suggests a direction which the Czech healthcare professionals and authorities should apply when implementing the preferred eHealth tools that proved to have the most benefits, namely secure portals and chatbots. Estimating a long process to implement them, which requires involving public discussion, international benchmark and best practice check, finance and organization clarification and gradual rollout, a temporary solution is presented: there is a good chance to start utilizing already available tool for online video which proved to be decreasing workload while keeping decent level of clinical security, as well as data security, if performed through clinical software. Of course, the implementation of any centralized communication system should ideally be implemented within stable political environment allowing consistent and aligned eHealth strategy among major political players and institutions. Nonetheless, higher set of actions will be more successful if presented to professionals and public as a tool "improving a service" rather than "implementing a technology". Finally, it needs to be mentioned that such a complex topic offers more aspects to consider which were not described in this thesis in bigger detail. Firstly, clinical safety of evaluated tools needs to be assessed in the context of whole population among all age groups, rather than in studies being performed with actual users that are often younger, not having any health issues. Secondly, future higher uptake of chatbots requires addressing questions regarding ethic and responsibility which should be further investigated. Moreover, any major changes in healthcare system have always been a typical and sensitive topic in political discussions and therefore one of the related topics worth further assessment in the context of digitalisation and eHealth services could be its financing and related political perceptions of improving healthcare availability.

Acknowledgment

I would like express my sincere gratitude to Prof. Jarmo Reponen MD, Ph.D. and Anna Maijala, M.H.Sc., for their patient and kind supervision during working on this project at University of Oulu; and to Ing. Zuzana Kotherová, Ph.D. for her guidance and advices during my Diploma Thesis supervision at Czech Technical University in Prague.

References

[1.] PTÁČEK, R. and BARTŮNĚK, P. Etika a komunikace v medicíně. 2011. ISBN 9788024739762.

[2.] YE, J., et al. E-mail in patient provider communication: A systematic review. Patient Education and Counseling [online]. 2010, 80, 266–273. Available at: doi:10.1016/j.pec.2009.09.038.

[3.] LEE, Joy L., et al. Patient Use of Email, Facebook, and Physician Websites to Communicate with Physicians: A National Online Survey of Retail Pharmacy Users. Journal of General Internal Medicine [online]. 2016. ISSN 15251497. Available at: doi:10.1007/s11606-015-3374-7.

[4.] ATHERTON, H., et al. Alternatives to the face-to-face consultation in general practice: Focused ethnographic case study. British Journal of General Practice [online]. 2018, 68(669), e293–e300.ISSN 14785242. Available at: doi:10.3399/bjgp18X694853.

[5.] STŘEDA, L. and HÁNA, K. eHealth a telemedicína: Učebnice pro vysoké školy. 2016. ISBN 978-80-271-9042-3.

[6.] HANNA, L., et al. The place of information and communication technology-mediated consultations in primary care: GPs' perspectives. Family Practice [online]. 2012, 29(3), 361–366. ISSN 02632136. Available at: doi:10.1093/fampra/cmr087.

[7.] PETERSON, C. et al. From innovation to implementation – eHealth in the WHO European Region. 2016. ISBN 978 92 890 5137 8.

[8.] MINISTERSTVO ZDRAVOTNICTVÍ ČR. The National eHealth Strategy of the Czech Republic. 2016.

[9.] BASHSHUR, R. L. et al. The empirical foundations of telemedicine interventions for chronic disease management. Telemedicine and e-Health [online]. 2014, 20(9), 769–800. ISSN 15563669. Available at: doi:10.1089/tmj.2014.9981

[10.] GOODRIDGE, D. and MARCINIUK D. Rural and remote care. Chronic Respiratory Disease [online]. 2016, 13(2), 192–203. ISSN 14799731. Available at: doi: 10.1177/1479972316633414.

[11.] OHANNESSIAN, R. Telemedicine: Potential applications in epidemic situations. European Research in Telemedicine [online]. 2015, 4(3), 95–98. ISSN 2212764X. Available at: doi:10.1016/j.eurtel.2015.08.002.

[12.] SMITH, A.C. et al. Telehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19). Journal of telemedicine and telecare [online]. 2020, 1357633X20916567. ISSN 1758-1109. Available at: doi: 10.1177/1357633X20916567.

[13.] KITTLER, A. F., et al. Primary care physician attitudes towards using a secure web-based portal designed to facilitate electronic communication with patients. Informatics in Primary Care [online]. 2004, 12(3), 129–138. ISSN 14760320. Available at: doi:10.14236/jhi.v12i3.118.

[14.] WORLD HEALTH ORGANISATION. Strengthening the Health Systems Response to COVID-19 Technical Guidance #1. 2020.

[15.] BÝMA, S., ŠONKA P., SEIFERT B. and ŠTOLFA J. Koncepce oboru všeobecné praktické lékařství 2018 [online]. 2018 [accessed. 2020-01-10]. Available at: https://www.svl.cz/o-nas/koncepce-oboru-vseobecne-prakticke-lekarstvi-2018/.

[16.] BRERETON, P. et al. Lessons from applying the systematic literature review process within the software engineering domain. Journal of Systems and Software [online]. 2007, 80(4), 571–583. ISSN 01641212. Available at: doi:10.1016/j.jss.2006.07.009.

[17.] COWIE, J. et al. Evaluation of a digital consultation and self-care advice tool in primary care: A multi-methods study. International. Journal of Environmental Research and Public Health [online]. 2018, 15(5). ISSN 16604601. Available at: doi:10.3390/ijerph15050896.

[18.] ATHERTON, H. et al. Experiences of using email for general practice consultations: A qualitative study. British Journal of General Practice [online]. 2013, 63(616), 760–767. ISSN 09601643. Available at: doi:10.3399/bjgp13X674440.

[19.] DASH, J. et al. Use of email, cell phone and text message between patients and primary-care physicians: crosssectional study in a French-speaking part of Switzerland. BMC Health Services Research [online]. 2016, 16(1), 1–7. ISSN 14726963. Available at: doi:10.1186/s12913-016-1776-9.

[20.] CASEY, Michael, Sara SHAW and Deborah SWINGLEHURST. Experiences with online consultation systems in primary care: Case study of one early adopter site. British Journal of General Practice [online]. 2017, 67(664), e736–e743. ISSN 14785242. Available at: doi:10.3399/bjgp17X693137.

[21.] FAGERLUND, A. et al. General practitioners' perceptions towards the use of digital health services for citizens in primary care: a qualitative interview study [online]. 2019, 1–7. Available at: doi:10.1136/bmjopen-2018-028251.

[22.] HUYGENS, M.W.J., et al. Understanding the use of email consultation in primary care using a retrospective observational study with data of Dutch electronic health records. BMJ Open [online]. 2018, 8(1). ISSN 20446055. Available at: doi:10.1136/bmjopen-2017-019233.

[23.] DANMARKS STATESTIK. Contacts covered by the public health insurance by region, type of benefits, age and sex: general practitioners [online]. 2020 [accessed. 2020-04-25]. Available at: https://www.dst.dk/da/Statistik/nyt/NytHtml?cid=30625.

[24.] ATHERTON, H. et al. The potential of alternatives to face-to-face consultation in general practice, and the impact on different patient groups: a mixed-methods case study. Health Services and Delivery Research [online]. 2018, 6(20), 1–200. ISSN 2050-4349. Available at: doi:10.3310/hsdr06200.

[25.] JOHANSSON, A. et al. General Practitioners' Experiences of Digital Written Patient Dialogues: A Pilot Study Using a Mixed Method. Journal of Primary Care and Community Health [online]. 2020, 11. ISSN 21501327. Available at: doi:10.1177/2150132720909656.

[26.] ECCLES, A. et al. Patient use of an online triage platform: A mixed-methods retrospective exploration in UK primary care. British Journal of General Practice [online]. 2019, 69(682). ISSN 14785242. Available at: doi:10.3399/bjgp19X702197.

[27.] LÓPEZ SEGUÍ, F. et al. General Practitioners' Perceptions of Whether Teleconsultations Reduce the Number of Face-to-face Visits in the Catalan Public Primary Care System: Retrospective Cross-Sectional Study. Journal of medical Internet research [online]. 2020, 22(3). ISSN 14388871. Available at: doi:10.2196/14478.

[28.] FARR, M. et al. Implementing online consultations in primary care: A mixed-method evaluation extending normalisation process theory through service co-production. BMJ Open [online]. 2018, 8(3), 1–11. ISSN 20446055. Available at: doi:10.1136/bmjopen-2017-019966.

[29.] CARTER, M. et al. Feasibility, acceptability and effectiveness of an online alternative to face-to-face consultation in general practice: A mixed-methods study of webGP in six Devon practices. BMJ Open [online]. 2018, 8(2). ISSN 20446055. Available at: doi:10.1136/bmjopen-2017-018688.

[30.] BANKS, J. et al. Use of an electronic consultation system in primary care: A qualitative interview study. British Journal of General Practice [online]. 2018, 68(666), e1–e8. ISSN 14785242. Available at: doi:10.3399/bjgp17X693509.

[31.] COWIE, M.R., et al. e-Health: a position statement of the European Society of Cardiology. European Heart Journal [online]. 2016, 37(1), 63–66. ISSN 0195-668X. Available at: doi:10.1093/eurheartj/ehv416.

[32.] RIIPPA, I. et al. A patient portal with electronic messaging: Controlled before-and-after study. Journal of Medical Internet Research [online]. 2015, 17(11), 1–19. ISSN 14388871. Available at: doi:10.2196/jmir.4487.

[33.] EDWARDS, H.B., et al. Use of a primary care online consultation system, by whom, when and why: Evaluation of a pilot observational study in 36 general practices in South West England. BMJ Open [online]. 2017, 7(11), 1–9. ISSN 20446055. Available at: doi: 10.1136/bmjopen-2017-016901.

[34.] VREUGDENHIL, M. et al. Use and effects of patient access to medical records in general practice through a personal health record in the Netherlands. Journal of Medical Internet Research [online]. 2018, 20(9). ISSN 14388871. Available at: doi: 10.2196/10193.

[35.] ESSÉN, A., et al. Patient access to electronic health records: Differences across ten countries. Health Policy and Technology [online]. 2018, 7(1), 44–56. ISSN 22118845. Available at: doi:10.1016/j.hlpt.2017.11.003.

[36.] NØHR, Ch., et al. Nationwide citizen access to their health data: Analysing and comparing experiences in Denmark, Estonia and Australia. BMC Health Services Research [online]. 2017, 17(1), 1–11. ISSN 14726963. Available at: doi: 10.1186/s12913-017-2482-y.

[37.] CARE QUALITY COMMISSION. The state of care in independent online primary health services [online]. 2020 [accessed. 2020-04-22]. Available at: https://www.cqc.org.uk/publications/major-report/state-care-independent-online-primaryhealth-services#inspectedhttps://www.cqc.org.uk/publications/major-report/state-careindependent-online-primary-health-services%23inspected.

[38.] GOYDER, C. et al. Email for clinical communication between healthcare professionals. Cochrane Database of Systematic Reviews [online]. 2015, 2015(2). ISSN 1469493X. Available at: doi:10.1002/14651858.CD007979.pub3.

[39.] BAKHAI, M. et al. Using Online Consultations In Primary Care NHS England- implementation toolkit for practices [online]. 2020 [accessed. 2020-04-06]. Available at: https://www.england.nhs.uk/wp content/uploads/2020/01/online consultations65implementation-toolkit-v1.1-updated.pdf.

[40.] HOONAKKER, P.L.T., et al. The impact of secure messaging on workflow in primary care: Results of a multiple-case, multiple-method study. International Journal of Medical Informatics [online]. 2017, 100, 63–76. ISSN 18728243. Available at: doi:10.1016/j.ijmedinf.2017.01.004.

[41.] BRANT, H., et al. Using alternatives to face-to-face consultations: A survey of prevalence and attitudes in general practice. British Journal of General Practice [online]. 2016, 66(648), e460–e466. ISSN 09601643. Available at: doi:10.3399/bjgp16X685597.

[42.] DONAGHY, E. et al. Acceptability, benefits, and challenges of video consulting: A qualitative study in primary care. British Journal of General Practice [online]. 2019, 69(686), E586–E594. ISSN 14785242. Available at: doi:10.3399/bjgp19X704141.

[43.] LEAHY, D. et al. Use of text messaging in general practice: A mixed methods investigation on GPs' and patients' views. British Journal of General Practice [online]. 2017, 67(664), e744–e750.- ISSN 14785242. Available at: doi: 10.3399/bjgp17X693065.

[44.] HAMMERSLEY, V. et al. Comparing theccontent and quality of video, telephone, and face-to-face consultations: A non-randomised, quasiexperimental, exploratory study in UK primary care. British Journal of General Practice [online]. 2019, 69(686), E595–E604. ISSN 14785242. Available at: doi: 10.3399/bjgp19X704573.

[45.] VISOLVE.com, Patient Portals available online on https://www.visolve.com/hc/patientportal/features.html accessed on 26.4.2019.

[46.] NHS ENGLAND. Update report on the Cavendish Health Centre Remote Consultation Service Pilot Project, Implementing Skype Consultations in General Practice, 2014, available: https://www.centrallondonccg.nhs.uk/media/24178/CLCCG-Cavendish-Skype-pilot-interim-report.pdf, accessed on 26.4.2019.

[47.] SUNDHED.DK. Here's how to get started with Video Consultation [online]. Available at: https://www.sundhed.dk/borger/behandling og rettigheder/videokonsultationvejledning-borger/, accessed on 25.03.2020.

[48.] THIEL, R. et al. #SmartHealthSystems: International comparison of digital strategies. Der Digitale Patient. 2018.

[49.] RANDHAWA, R.S., et al. An exploration of the attitudes and views of general practitioners on the use of video consultations in a primary healthcare setting: A qualitative pilot study. Primary Health Care Re-

search and Development [online]. 2018, 20. ISSN 14771128. Available at: doi: 10.1017/S1463423618000361.

[50.] BERSON Tom, Anagram Laboratories. Skype security evaluation 2005. Available online: https://download.skype.com/share/security/2005-031%20security%20evaluation.pdf , accessed on 29.4.2019

[51.] NICOLÁS, I.M. et al. The impact of a comprehensive electronic patient portal on the health service use: An interrupted time-series analysis. European Journal of Public Health [online]. 2019, 29(3), 413–418. ISSN 1464360X. Available at: doi:10.1093/eurpub/cky257.

[52.] POWELL, R. E., et al. Patient perceptions of telehealth primary care video visits. The Annals of Family Medicine, 2017, 15.3: 225-229.

[53.] NHS ENGLAND. Summary research findings, 2019, available: https://www.england.nhs.uk/wp-content/uploads/2019/09/online-consultations-reserach-summary-of-findings.pdf, accessed on 26.4.2019.

[54.] GP ACCESS. AskMyGP report [online]. 2020 [accessed. 2020-03-25]. Available at: https://askmygp.uk/patient-choice-figures-2019/

[55.] RUKMAN, J. Patent Application Publication: System and Method for Threading SMS with MMS. 2003.

[56.] HALL, A.K., et al. Mobile Text Messaging for Health: A Systematic Review of Reviews. Annual Review of Public Health [online]. 2015, 36(1), 393–415. ISSN 0163-7525. Available at: doi: 10.1146/annurev--publhealth-031914-122855.

[57.] HEAD, Katharine J., et al. Efficacy of text messaging-based interventions for health promotion: a meta-analysis. Social science & medicine, 2013, 97: 41-48

[58.] ACCURX, Chain SMS available online: https://www.accurx.com/chainsms accessed on 26.4.2019

[59.] PRACTICEINDEX.CO.UK, messaging services available online on: https://practiceindex.co.uk/gp/services/sms-text-messaging-services/voice-connect accessed on 26.4.2019

[60.] PRACTICEINDEX.CO.UK, messaging services brochure available online on: https://practiceindex.co.uk/gp/lanotattachments/download/file/id/3/store/1/medical_messenger_-_brochure.pdf accessed on 26.4.2019

[61.] KAMEL BOULOS, Maged; GIUSTINI, Dean; WHEELER, Steve. Instagram and WhatsApp in health and healthcare: An overview. Future Internet, 2016, 8.3: 37.

[62.] QUINLAN, D., et al. Patient Texting in General Practice: Who, Why, Why Not? A National Survey of Text Messaging in Irish General Practice. Irish medical journal, 2018.

[63.] JENSSEN, Brian P., et al. Using digital technology to engage and communicate with patients: a survey of patient attitudes. Journal of general internal medicine, 2016, 31.1: 85-92.

[64.] DE ANGELIS, Gino, et al. The use of social media among health professionals to facilitate chronic disease self-management with their patients: A systematic review. Digital health, 2018, 4: 2055207618771416.

[65.] ANHØJ, Jacob; NIELSEN, Lene. Quantitative and qualitative usage data of an Internet-based asthma monitoring tool. Journal of Medical Internet Research, 2004, 6.3: e23.m

[66.] PADREZ, Kevin A., et al. Linking social media and medical record data: a study of adults presenting to an academic, urban emergency department. BMJ Qual Saf, 2016, 25.6: 414-423.

[67.] VENTOLA, C. Lee. Social media and health care professionals: benefits, risks, and best practices. Pharmacy and Therapeutics, 2014, 39.7: 491.

[68.] KOVIC, Ivor; LULIC, Ileana; BRUMINI, Gordana. Examining the medical blogosphere: an online survey of medical bloggers. Journal of medical internet research, 2008, 10.3: e28.

[69.] GRAJALES, FJ et al. Social media: A review and tutorial of applications in medicine and health care. Journal of Medical Internet Research [online]. 2014, 16(2). ISSN 14388871. Available at: doi:10.2196/jmir.2912.

[70.] GEORGE, Daniel R. Making 'social' safer: Are Facebook and other online networks becoming less hazardous for health professionals? Journal of Clinical Ethics. 2012, 23(4), 348–352. ISSN 10467890.

[71.] BAPTIST, Alan P., et al. Social media, text messaging, and email—preferences of asthma patients between 12 and 40 years old. Journal of Asthma, 2011, 48.8: 824-830.

[72.] GOODYEAR-SMITH, Felicity, et al. eCHAT for lifestyle and mental health screening in primary care. The Annals of Family Medicine, 2013, 11.5: 460-466.

[73.] PALANICA, Adam, et al. Physicians' Perceptions of Chatbots in Health Care: Cross-Sectional Web-Based Survey. Journal of Medical Internet Research, 2019, 21.4: e12887.

[74.] eHealth Network Mobile applications to support contact tracing in the EU's fight against COVID-19. Available online on: https://ec.europa.eu/health/sites/default/files/ehealth/docs/covid-19_apps_en.pdf accessed on 26.6.2020

[75.] DUANE, Sinead, Meera TANDAN, Andrew W MURPHY and Akke VELLINGA. Using Mobile Phones to Collect Patient Data: Lessons Learned From the SIMPle Study. JMIR Research Protocols [online]. 2017, 6(4), e61. ISSN 1929-0748. Available at: doi:10.2196/resprot.6389.

[76.] SUMMERTON, Nick and Martin CANSDALE. Artificial intelligence and diagnosis in general practice. British Journal of General Practice [online]. 2019, 69(684), 324–335. ISSN 14785242. Available at: doi:10.3399/bjgp19X704165.

[77.] MIDDLETON, Katherine, Mobasher BUTT, Nils HAMMERLA, Steven HAMBLIN, Karan MEHTA and Ali PARSA. Sorting out symptoms: design and evaluation of the 'babylon check' automated triage system. 2016.

[78.] POWELL, John. Trust me, i'm a chatbot: How artificial intelligence in health care fails the turing test. Journal of Medical Internet Research [online]. 2019, 21(10), 1–5. ISSN 14388871. Available at: doi:10.2196/16222.

[79.] RAZZAKI, Salman, et al. A comparative study of artificial intelligence and human doctors for the purpose of triage and diagnosis. arXiv preprint arXiv:1806.10698, 2018.

[80.] PwC Artificial intelligence in healthcare report, 2017, available online: https://www.pwc.com/gx/en/industries/healthcare/publications/ai-robotics-new-health/ai-robotics-new-health.pdf , accessed on 29.4.2019

[81.] CASTRÉN, J. et al. Use of email for patient communication in student health care: A cross-sectional study. BMC Medical Informatics and Decision Making [online]. 2005, 5, 1–6. ISSN 14726947. Available at: doi:10.1186/1472-6947-5-2.

[82.] GRANLUND, Håkan, Carl Johan THODEN, Christer CARLSON and Kari HARNO. Realtime teleconsultations versus face-to-face consultations in dermatology: Immediate and six-month outcome. Journal of Telemedicine and Telecare [online]. 2003, 9(4), 204–209. ISSN 1357633X. Available at: doi:10.1258/135763303322225526.

[83.] CHUDNER, Irit, Anat DRACH-ZAHAVY and Khaled KARKABI. Choosing Video Instead of In-Clinic Consultations in Primary Care in Israel: Discrete Choice Experiment Among Key Stakeholders—Patients, Primary Care Physicians, and Policy Makers. Value in Health [online]. 2019, 22(10), 1187–1196. ISSN 15244733. Available at: doi:10.1016/j.jval.2019.05.001.

[84.] WILLIAMS, James. Social networking applications in health care: Threats to the privacy and security of health information. Proceedings - International Conference on Software Engineering [online]. 2010, 39–49. ISSN 02705257. Available at: doi:10.1145/1809085.1809091.

[85.] PETERS, Louis, Geva GREENFIELD, Azeem MAJEED and Benedict HAYHOE. The impact of private online video consulting in primary care. Journal of the Royal Society of Medicine [online]. 2018, 111(5), 162–166. ISSN 01410768. Available at: doi:10.1177/0141076818761383.

[86.] KLOCEK, Adam, Martina ŠMAHELOVÁ, Lenka KNAPOVÁ and Steriani ELAVSKY. GPs'perspectives on eHealth use in the Czech Republic: a cross-sectional mixed-design survey study. BJGP Open [online]. 2019. ISSN 2398-3795. Available at: doi:10.3399/bjgpopen19x101655.

[87.] DUMAY, Adrie C M and Timber I. HAAKER. The electronic locum record for general practitioners: Outcome of an evaluation study in the Netherlands. International Journal of Medical Informatics [on-

line]. 2010, 79(9), 623–636. ISSN 13865056. Availableat: doi:10.1016/j.ijmedinf.2010.06.001.

[88.] SCHOENFELD, A.J., et al. Variation in quality of urgent health care provided during commercial virtual visits. JAMA Internal Medicine [online]. 2016, 176(5), 635–642. ISSN 21686106. Available at: doi:10.1001/jamainternmed.2015.8248.

[89.] MOORHEAD, S. A., et al. A new dimension of health care: Systematic review of the uses, benefits, and limitations of social media for health communication. Journal of Medical Internet Research [online]. 2013, 15(4), 1–17. ISSN 14388871. Available at: doi:10.2196/jmir.1933.

[90.] DYER-SMITH, Ross and Badial GURBAKSH. eHub: Enhancing the emergence of the electronic consultation. British Journal of General Practice [online]. 2019, 69(1). Available at: doi:10.3399/bjgp19X703673.

[91.] MOHAMMED, M.A., et al. The value of a Patient Access Portal in primary care: a cross-sectional survey of 7162,486 registered users in the UK. Universal Access in the Information Society [online]. 2019, (0123456789). ISSN 16155297. Available at: doi:10.1007/s10209-019-00693-8.

[92.] KITTLER, A. F., et al. Primary care physician attitudes towards using a secure web-based portal designed to facilitate electronic communication with patients. Informatics in Primary Care [online]. 2004, 12(3), 129–138. ISSN 14760320. Available at: doi:10.14236/jhi.v12i3.118.

PŘÍNOSY A OMEZENÍ KOMUNIKAČNÍCH NÁSTROJŮ EHEALTH U PRAKTICKÝCH LÉKAŘŮ

Ludmila Bernotová

Abstrakt

Digitalizace zdravotnictví je logickým důsledkem infiltrace technologií do všech oblastí lidské činnosti. Vývoj eHealth nabízí nová řešení pro vzdálenou interakci lékaře a pacienta. Cílem této práce je prozkoumat, jaké komunikační nástroje eHealth praktičtí lékaři (PL) v současné době používají pro konzultace s pacienty, a analyzovat jejich přínosy a omezení. Byl proveden systematický literární přehled k získání důkazů o eHealth komunikačních nástojích a jejich dopadu na pracovní vytížení PL, zabezpečení systému, zdravotní rizika a z pohledu vnímání konzultační technologie uživatelem. Zabezpečené portály a chatboty poskytují nejvyšší potenciál ke snížení pracovní zátěže a poskytují nejzabezpečenější konzultační prostředí. Zdravotní rizika jsou vyšší, pokud komunikační kanál není integrován do elektronického zdravotního záznamu pacienta. Vnímání komunikačních technologií pacienty v primární péče je celkově pozitivnější než praktickými lékaři.

Contact

Ing. Mgr. Ludmila Bernotová
e-mail: *ludmila.bernotova@post.cz*