

## Information and Communication Technologies in Primary Healthcare – Barriers and Facilitators in the Implementation Process

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**Abstract.** Despite the great expansion and many benefits of information and communication technologies (ICT) in healthcare, the attitudes of Polish general practitioners (GPs) to e-health have not been explored. The aim of this study was to determine the GPs' perception of ICT use in healthcare and to identify barriers to the adoption of EMR (Electronic Medical Records) in the Podlaskie Voivodeship. Online and telephone surveys were conducted between April and May 2013. Responses from 103 GP practices, 43% of all practices in the region, were analysed. The results showed that 67% of the respondents agreed that IT systems improve quality of healthcare services. In the GP group who declared at least partial EMR implementation, 71.4% see the positive impact of IT on practice staff processes and 66.1% on personal working processes. In this group, more than three-quarters of GPs did not see any positive impact of ICT on the average number of patients treated per day, number of patients within the practice or scope of services. The four most common barriers to EMR implementation were: lack of funds, risk of a malfunction in the system, resistance to change, and lack of training and proper information. Although the use of ICT by Polish GPs is limited, their attitude to e-health is generally positive or neutral and resembles the overall pattern in Europe. Barriers identified by GPs need to be taken into account to ensure the effective implementation of e-health across the country.

## Introduction and Objectives

Implementation of new Information and Communications Technology (ICT) solutions in the healthcare systems of the most developed countries has allowed for the development of e-health tools: Electronic Medical Records (EMR), Electronic Health Record (EHR), e-prescription and e-referrals. They improve quality of healthcare and organization of work, and increase cost-effectiveness. A systematic review of 257 studies on the

impact of ICT solutions in outpatient and inpatient settings revealed that quality of healthcare improved because of an increase in guideline-driven care, enhanced surveillance and monitoring and decreased medication errors (Chaudhry et al., 2006). A study of 119 ambulatory healthcare units confirmed that Health Information Technology (HIT) improves clinical outcomes, increases the use of vaccinations and improves medication adherence. Moreover, it has led to cost savings for physicians, improved staff productivity and enriched patient-provider interactions (Police et al., 2010).

On the other hand, some publications indicate that HIT has not always led to a better quality of care (Linder et al., 2007; Romano et al., 2011). It has often prolonged working time (Poissant et al., 2005) and has disrupted workflow causing temporary declines in productivity (Menachemi et al., 2011). Implementation of ICT may be financially beneficial in the long term, but in the early years there are enormous costs of the IT software as well as training and management of the system (Hillestad et al., 2005). A cost-benefit analysis of replacing paper medical records with electronic medical records in a primary care clinic in the US showed that the estimated net benefit for a 5-year period was \$86 400 while the total 5-year cost equalled \$46 400 per provider (Wang et al., 2003). Negative phenomena related to the digitalisation of healthcare are particularly prominent in the early stages of IT system implementation, with its low level of functionality and its mismatch to the needs of users (Zakaria et al., 2010).

The processes of adaptation of IT solutions in the healthcare sector began in the 1970s, but only a few countries currently use EMR (Protti et al., 2010; Schoen et al., 2012). In Poland, patient data are stored electronically in only 15% of GP practices (Pędziński et al., 2013) and 8% of hospitals (Najwyższa Izba Kontroli, 2013). Beginning on 1/08/2014, it will be a legal requirement for all Polish healthcare providers to use electronic medical records only (Ustawa z dnia 28 kwietnia 2011 o systemie informacji w ochronie zdrowia, 2011). In a very short time, widespread implementation of e-prescriptions, e-referrals and personal health records (PHR) is planned. Successful adaptation of e-health systems and the implementation of EMR will be highly dependent on the medical staff's attitudes to this process and their perceptions of barriers and facilitators related to it. GPs coordinate the patient in a healthcare system and will determine the success of new solutions such as e-prescription, e-referral for diagnostic tests and e-referral to a specialist. They will be the key element, as they are the first and most frequent point of contact with the patient (Pike, 2010). Referring the patient to the various levels of the healthcare system and providing continuous and long-term care is strongly associated with the information

about the patient that GPs will receive and generate (Kahn, 2004; Peterson, 2012). Family doctors play a key role in the adaptation of EHR and Personal Health Record (PHR) while they are responsible for the majority of data entry. The digitalisation of the health sector in the vast majority of countries started from the primary care sector (Lockhart, 2008). Therefore, it is important to understand the barriers and opportunities for implementation of HIT as perceived by primary care physicians.

## **Material and Methods**

The study was conducted between April and May 2013. Online and telephone surveys were aimed at 237 primary healthcare providers contracted by the National Health Fund in the Podlaskie Voivodeship. In practices with more than one doctor, the one whose surname came first in the alphabet was interviewed. After exclusion of one survey with incomplete data, 103 questionnaires were included in the analysis. They represented 43% of primary healthcare clinics in the voivodeship.

Questions concerning GP attitudes towards ICT were obtained from the Dobrev et al. (2008) study. The questions on barriers to EMR adoption were based on the barriers most often listed in the Polish scientific and gray literature. The questions concerning GP attitudes towards ICT and perception of impact of ICT use were multichotomous (one of three possible answers). Positive impacts of ICT on healthcare were defined as: decreases in the workload of support staff, increases in the scope of services, increases in the average number of patients treated per day, increases in the number of patients within the practice (data presented in Table 1). The questions regarding barriers to EMR implementation included 8 potential barriers and the respondent could choose up to 4. A survey questionnaire for both telephone and online interviews was designed with *Google Forms*. *SPSS Statistics® 20.0* was used for statistical analysis. The chi-square test was used to evaluate differences in perceived barriers among EMR adopters and a non-adopters group with the significance level  $\alpha = 0.05$ .

## **Results**

In the studied primary healthcare units, from 1 to 11 doctors worked under different forms of employment, while the percentage of institutions with one doctor accounted for 35%, two doctors – 28.2%, and three doctors

**Table 1. GPs' attitudes towards ICT use in healthcare in the Podlaskie Voivodeship**

Questions	Agree	Don't know	Disagree
the use of software and IT systems improves the quality of healthcare services	67.0%	18.4%	14.6%
the use of software and IT systems in healthcare should be included in the medical education	87.4%	8.7%	3.9%
to really benefit from IT, all health actors have to share clinical information in a network	72.8%	16.5%	10.7%
IT systems would be more used if GPs were provided with more training	72.8%	14.6%	12.6%
my practice would need better support with the maintenance of IT systems	81.6%	8.7%	9.7%
the cost of IT is ultimately the decisive factor on the use of ICT	66.0%	15.5%	18.5%
the use of telemonitoring will in the future allow physicians to treat people with chronic conditions better	67.0%	25.2%	7.8%

– 12.6%. There were 36.9% rural and 63.1% urban practices. The ages of the GPs ranged from 29–71 years (mean  $51.1 \pm 9.1$ ) and 64.1% were female.

Two thirds of general practitioners (67.0%) agreed that software and IT systems improve the quality of healthcare services. The vast majority of interviewees agreed that the use of software and IT systems in healthcare should be included in the medical education system (87.4%) and that their unit would need better support with the maintenance of an IT system (81.6%). A similar percentage of physicians saw the need to establish a network to share clinical information and training for a wider use of IT systems (72.8% accordingly). 66.0% of physicians agreed that the cost of IT was ultimately the decisive factor for the use of ICT and 67.0% believed that telemonitoring would allow for better care for chronic patients in the future (Table 1).

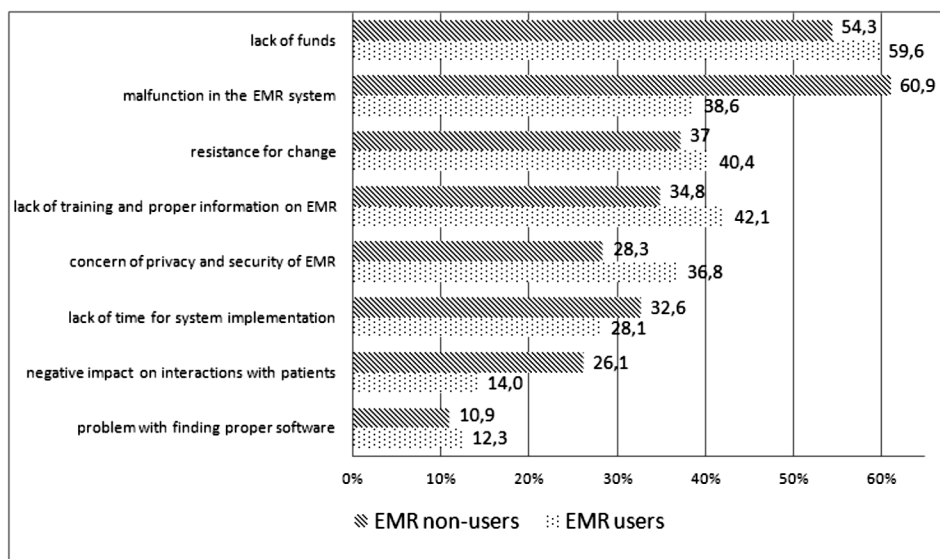
GPs who declared either partial or full implementation of an EMR system had a positive or neutral attitude to ICT use in healthcare (Table 2). Most GPs recognised the positive impact of ICT on the working processes of practice staff (66.1%) and on a personal level (71.4%). More than three-quarters of GPs did not report any impact on the average number of patients

**Table 2. GPs' perceptions of impacts of ICT on healthcare in user groups in the Podlaskie Voivodeship**

Impacts of ICT use	positive	none	negative
on personal working processes	71.4%	21.4%	7.1%
on practice staff working processes	66.1%	19.6%	14.3%
on quality of diagnosis and treatment decisions	44.6%	53.6%	1.8%
on workload of support staff	41.1%	25.0%	33.9%
on scope of services	7.1%	92.9%	0.0%
on doctor–patient relationship	25.0%	42.9%	32.1%
on average number of patients treated per day	8.9%	76.8%	14.3%
on number of patients in practice	5.4%	82.1%	12.5%

treated per day (76.8%), number of patients within the practice (82.8%) or scope of services (92.9%). A negative attitude was presented by only one-third of physicians: 32.1% believed that ICT had a negative impact on the patient-doctor relationship and 33.9% – that it had a negative impact on the support staff's workload. 44.6% stated that ICT had a positive impact and 53.6% stated that there was no impact on the quality of diagnosis and treatment.

The respondents were asked to choose a maximum of 4 from a list of 8 potential barriers to implementation of an EMR system. 57.3% identified lack of funds, 48.5% concern of a malfunction in the system, 38.8% resistance to change and 38.2% lack of training and proper information. Other barriers included: privacy and security issues (33.0%), lack of time for system implementation (30.1%), negative impact on doctor–patient interaction (19.4%) and difficulties in finding the right software (11.7%). In the studied group of 103 GPs, there were 57 (55.3%) GPs who declared partial or full implementation of an EMR system (adopters group) and 46 (44.7%) GPs who declared no EMR implementation (non-adopters group). Perceived barriers to implementation of EMR in both groups are presented in figure 1. A significant difference between groups ( $p = 0.025$ ) was observed only for the concern of malfunction in the system. The general attitude to EMR system implementation was analysed only in GPs who declared partial or complete implementation. In this group, there were 27 satisfied, 22 rather satisfied, 3 rather dissatisfied and 4 dissatisfied with the EMR system.



**Figure 1. Barriers to EMR system implementation in user and non-user groups**

## Discussion

Despite a low level of HIT adaptation in Poland, 67% of surveyed GPs believed that the use of software and IT systems improves the quality of healthcare services. This result was similar to the European survey on Benchmarking ICT use in 2008 (Dobrev et al., 2008), which showed that, regardless of the degree of implementation of ICT in the country, most physicians see opportunities to use IT systems to improve the quality of services. In some studies where the attitudes towards ICT use were analysed between EHR adopters and non-adopters, the results have shown that physicians who at least partially implemented the system were more convinced of the positive effects than those who had never worked with it (Jha, DesRoches et al., 2009; Leung et al., 2003; Morin et al., 2005; Sequist et al., 2007).

In the 2008 Benchmarking ICT study (Dobrev et al., 2008; European Commission. Information Society and Media Directorate General, 2007), the most important facilitating factors in Europe and in Poland were as follows: the need for e-health inclusion in medical education, the need for more IT training and a better networking of all healthcare in order to share clinical information. These results are in line with what was found in the Podlaskie Voivodeship. However, when it comes to the potential barriers one significant difference can be noted. In Poland in 2008, cost was a decisive

factor concerning ICT use and was seen as more important than lack of ICT maintenance support, while in our study these relationships were opposite. This observation could be partly explained due to the fact that five years had passed. In the 5-year period between the observations in question, some GPs implemented the EMR systems, so they must have overcome the financial barrier. Nevertheless, cost is still the crucial barrier to ICT use. Generally, 66% of GPs declared that the cost of IT is ultimately the decisive factor on the use of ICT and the highest proportion of GPs (57.3%) identified lack of funds as one of eight potential barriers to EMR system implementation.

When it comes to GPs' perceptions of the impacts of ICT use, the results found in the Podlaskie Voivodeship were strongly in line with the general pattern in Poland and other European countries in 2008 (Dobrev et al., 2008). The GPs who declared partial or entire implementation of EMR were most positive that ICT use improved personal working processes and practice staff working processes. Most of the GPs did not see any positive impact on the workload of support staff, quality of diagnosis and treatment decisions, scope of services offered, doctor–patient relationship, the average number of patients treated per day, or the number of patients in the practice.

The four most common barriers to EMR implementation in the Podlaskie Voivodeship were: lack of funds, risk of a malfunction in the system, resistance to change and lack of training and proper information. The lack of funds as a major barrier to adoption of EMR has been shown in several other studies, particularly in the US (DesRoches et al., 2013; Gans et al., 2005; Jha, DesRoches et al., 2009; Miller et al., 2004). The risk of a malfunction in the system, defined as: slow system speed, system downtime and inadequate ICT resources, were reported by Georgiou et al. (2009), Hier et al. (2005) and Kossman et al. (2008). Resistance to change very often results from lack of training and proper information about EMR; therefore, these factors are strongly connected with a lack of understanding of potential benefits (Hackl et al., 2009; Loomis et al., 2002; Saleem et al., 2005). Other common personal and organisational barriers to EHR adoption were analysed in the CMVH Literature Review 2010 (Cotea, 2010).

In our study, the analysis of EMR users' and non-users' perceptions of barriers revealed a statistically significant difference only in the concern of a malfunction in the system. This concern was more often reported by physicians who had not implemented the system than by those who had implemented the system. This may suggest that the system malfunction risk is less common in real use than it is conceived to be. There is also a risk that physicians who haven't implemented the system tend to exaggerate the

malfunction in the system. Such an attitude may be caused by lack of proper information in medical society or may suggest that some physicians prefer to stress external problems (system malfunction) rather than deal with internal barriers (resistance for change or lack of time). The analysis of other differences in the perceived barriers of EMR between users and non-users is limited due to small sample size and discrepancies between declared and real implementation stages of EMR systems. In the studied group of 103 GPs, 55.3% declared partial or full implementation of an EMR system, while in fact only 14.7% stored complete patient medical histories (i.e., simultaneous collection of data on medical diagnoses, drug prescriptions, medical interviews, physical examinations, anthropometric measurements and diagnostic test results) (Pedzinski et al., 2013).

## Conclusions

In the Podlaskie Voivodeship the GP's attitude to ICT in primary healthcare is generally positive or neutral and resembles the overall pattern in Europe. Lack of funds, risk of a malfunction in the system, resistance to change and lack of training as well as proper information about EMR were the most common barriers to EMR implementation. Statistically significant differences between EMR users' and non-users' perceptions of barriers were only shown in the concern of a malfunction in the EMR system, which suggests that this problem might be exaggerated.

It is crucial to take into account the barriers perceived by GPs while their attitudes are a significant factor in the acceptance and efficiency of EMR in practice. Unfortunately, the legal obligation for healthcare providers to implement EMR without any financial or non-financial incentives may undermine the widespread use of e-health.

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