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SOME GEOGRAPHICAL ASPECTS OF TELEMEDICINE IN HUNGARY

Theses of Ph.D. dissertation

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I. Justification of research topic

Telemedicine is an innovative form of medical service, gaining more importance in healthcare, as it can theoretically reduce some of the structural problems and territorial disparities of the healthcare system (CRAIG, J. – PATTERSON, V. 2005, MATUSITZ, J. – BREEN, G.M. 2007).

The usage of telemedicine is facilitated by the proliferation and reduced cost of info-communication technologies (ICT) (DICKEN, P. 2011, HARVEY, D. 1989). The more and more widespread integration of telemedicine into the healthcare system generates benefits like faster accessibility, fair access, cost-efficiency, and high-quality medical service (CRAIG, J. – PATTERSON, V. 2005, MATUSITZ, J. – BREEN, G.M. 2007).

The justification of the research – in addition to the above – lies in the geographical aspects of the topic. Although telemedicine is an interdisciplinary field of medical science and IT, it is also closely linked to geography as it transforms the spatial characteristics of healthcare. It appears, inter alia, that telemedicine can provide proper healthcare in peripheral areas with bad traffic connections and unfavourable health infrastructure without the need to overcome significant distances. Although the physical distance between the patient and the healthcare provider still remains, the accessibility of the medical service increases and the time needed for the treatment decreases (FICZERE A. 2010).

The appreciation of telemedicine is shown by its frequent appearance in media, the increasing number of scientific publications, and the proliferation of various university researches, developments and co-operations. Moreover, the latest trends in health policy also emphasise the benefits of telemedicine (Egészségügyi Ágazati Stratégia 2015).

The difficulty is that the National Health Insurance Fund (OEP) (at present National Institute of Health Insurance Fund Management (NEAK)) – with certain exceptions – does not fund telemedicine (FICZERE A. 2010, 2012). Thus, there is actually no complete database, which lists the healthcare providers (public and/or private) dealing with telemedicine, although a regional database would be a starting point for a geographical analysis. Furthermore, despite the growing importance of telemedicine, a detailed analysis focusing on the spatial and social impacts of telemedicine – especially in Hungary – has not been conducted yet (NICOLINI, D. 2006).

II. Conceptual issues in telemedicine

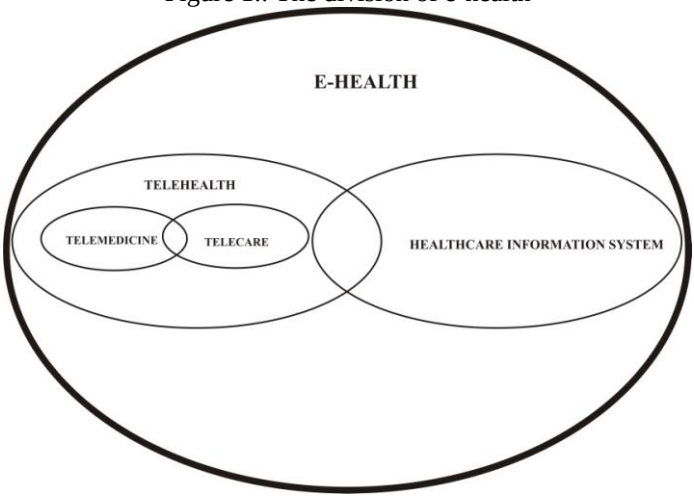
In general, telemedicine is a discursive concept with numerous interpretations and there is no consensus in the scientific community about what belongs within the scope of telemedicine (BASHSHUR, R.L. 1997).

Telemedicine has several synonyms. A study (SOOD, S.P. et al. 2007) – cited by the WHO – states that 104 expressions are counted to designate the types of services related to telemedicine. However, these definitions have in common that they interpret telemedicine as sort of an integration of info-communication technologies and healthcare (WHO 2010). This means that these technologies became an essential part of healthcare and so they basically determine it.

A short definition of the World Health Organization defines telemedicine as it „involves the delivery of health services using ICT, specifically where distance is a barrier to health care" (WHO 2011 p. 11).

In academic literature not only the *telemedicine* terminus is widespread but the terms *telehealth* and *e-health*, which are often incorrectly used as synonyms (Figure 1.). The essential difference between telemedicine and telehealth is that telemedicine includes (remote) healthcare provided by doctors only, while in the case of telehealth, the health services can also be provided by other health professionals (WHO 2010).

Figure 1.: The division of e-health



Source: based on BEUSCART, R. et al. 2014, editor by author

Telehealth also includes personalized and non-personal healthcare services, therefore, it is a much broader category than telemedicine. Besides, telehealth includes health development, disease prevention, education, and various administrative tasks. However, the largest group is e-health, which includes web-based electronic services related to health (BASHSHUR R.L. 2000, BEUSCART, R. et al. 2014, CUNNINGHAM, S.G. et al. 2014, LOPEZ, A.M. 2014).

Telemedicine can be broken down into additional areas, which strengthens its complexity. During *teleconsilium*, two or more doctors (or other health professionals) consult about a patient's status or making diagnoses (usually through video conference). In the case of t*elediagnostics* the diagnostician and the other health professionals are not located at the same place, but are separated in space and the connection between them is provided by info-communication technologies (FICZERE A. 2010a, 2010b). Teleradiology is a special field of telediagnostics. In teleradiology, the images obtained by radiographic techniques (X-ray, CT, etc.) are transferred from the place of examination with the use of ICT technology, and evaluated in a distant location (WHO 2010). During *telemanipulation*, the medical interventions and operations are executed through a remote sensor (and robot arm). In the case of *telemonitoring* various devices measuring health parameters provide the possibility of the monitoring process. This data is evaluated by the health personnel separated in space from the patient (FICZERE A. 2010a, 2010b).

III. Research objectives

The main aim of the research is to analyse the impact of telemedicine on healthcare considering spatial and social aspects. A further goal is to enhance scientific interest in telemedicine using the toolkit of health geography, which would be the main social benefit of the dissertation.

In accordance with this, the central question of the research is *how telemedicine is shaping spatial-social processes related to healthcare?* In connection with the main research question, further issues will also be investigated:

1. Which healthcare providers are affected?
2. How can the effects of telemedicine be evaluated on space and distance?
3. What are the main criteria of efficiency?
4. What factors obstruct/assist its diffusion and adaptation?
5. What is its impact on health inequalities?

6. How does it change interpersonal relationships?
7. How does it shape the health communities?

IV. Methodology

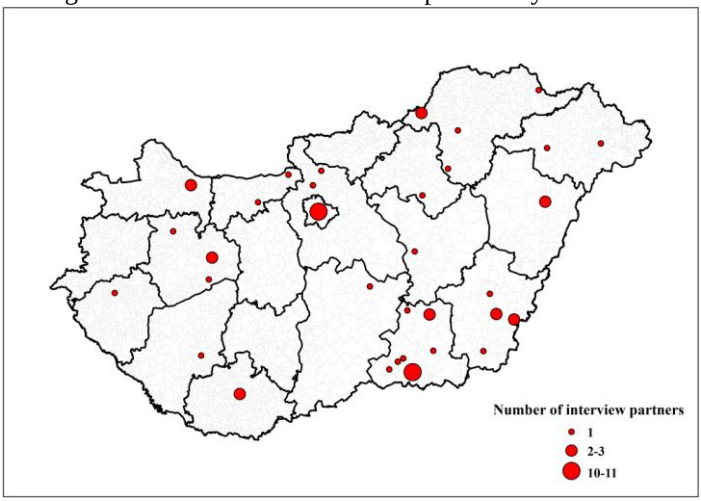
To answer the research questions, the use of qualitative research methods is essential, because the effects of telemedicine can only be revealed through the experience and opinion of professionals working in this field. Apart from this, methods based on quantitative statistical analysis cannot be ignored, although as previously mentioned, the lack of regional databases is a decisive obstacle in this case. Therefore, considering the complexity of the topic I found it relevant to apply both quantitative and qualitative research methods, such as questionnaires, semi-structured interviews, and content analysis.

Considering the lack of spatial database I started a primer data collection about where telemedicine is applied in Hungary. To do this, an online self-assessment questionnaire appeared to be the most suitable option. This method is relatively simple and quick, and in the case of a closed group where those who participate could be controlled, it may provide relevant information. The starting point was the list of the National Public Health and Medical Offices Service (ÁNTSZ) containing the healthcare providers with territorial service obligations.

The questionnaires were conducted between December 2013 and April 2014. During this time period the questionnaires were sent out to 508 email address and in the first round 206 returned filled out. However, due to several phone calls, email requests and web-based information collection, a 50 percent response rate was achieved. To explore the impact of telemedicine and understand its operating mechanism it was necessary to conduct semi-structured interviews. The selection of interviewees was based on the list of National Healthcare Services Center (ÁEEK). I visited the hospitals, which have indicated their involvement in telemedicine in the online questionnaires. In addition, I also used the social network of the already visited doctors (Figure 2.).

The interviews were conducted between August 2014 and October 2015. Within this time period, 63 interviews were made with various specialists, and to a lesser extent with general practitioners, IT specialists and healthcare managers. The majority of the interviews took place after a personal meeting, but I also conducted interviews via phone, Skype, and video conference, and the average duration of an interview was about 40 minutes.

Figure 2.: Distribution of interview partners by settlement



To complement the interviews a content analysis was performed between January and February 2016 to examine the impact of telemedicine on health communities. In the course of the content analysis, I studied the ten most important topics on a health-focused website within the columns „the doctor answers". The questions and answers were selected with simple random sampling, using a random number generator. I wanted to reach a 5 percent sampling rate, which in this case meant more than 2,5 thousand responses.

These were examined based on two indicators. On the one hand, is there direct or indirect reference in the answers about the necessity of seeing a doctor, which affects the workload of people working in the healthcare system. On the other hand, does the patient get useful therapeutic advice, which may result in health gain.

In addition to the interviews, a further questionnaire was conducted between September and October 2015 among general practitioners. The justification of this questionnaire was that general practitioners represent a hard-to-reach group among the interviewees.

With the help of the staff of the Department of Family Medicine, Faculty of Medicine, University of Szeged, 49 questionnaires were filled out by participants of additional training, which gave some insight into the attitudes of some general practitioner.

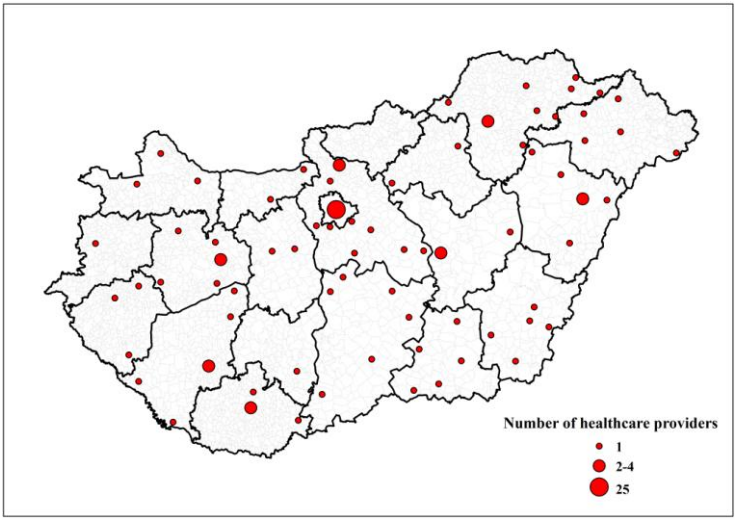
V. The summary of the results

1. The involvement of healthcare providers in telemedicine: During the online questionnaire we gathered information from 254 Hungarian healthcare providers. From this 108 deals with telemedicine, which corresponds to 42,5 percent. The results show that significant proportion of the healthcare providers involved with telemedicine during their healthcare activity despite the financial difficulties

In addition, half of the respondents deal with telemedicine since 3-5 years or more than 5 years. Thus, significant number of healthcare providers applies telemedicine for years, so in their case, it does not appear as a recent service but rather as a common practice.

The 108 healthcare providers are located relatively scattered in 74 settlements in the country. However, due to the characteristics of the Hungarian settlement system, a concentration can be observed in the Great Plain, in particular in the Southern Great Plain, while in some parts of Transdanubia with lower urbanization level, there are fewer concentration points (Figure 3). Among the healthcare providers, we can find county hospitals, clinics and newly renovated outpatient clinics too.

Figure 3.: The spatial distribution of healthcare providers affected by the use of telemedicine



2. ***The impact of telemedicine on space and distance:*** The effects generated by info-communication technologies significantly reduce the importance of physical distance in healthcare, which is a substantial benefit in large countries and areas.

However, in Hungary, the main aim of this innovative healthcare form is not to overcome of geographical distance but to ensure the optimal distribution of labour force and reduce the territorial difference in human resource shortage. This, in turn, gives legitimacy especially for teleradiology within telemedicine.

At the same time, people are becoming less dependent on their geographic location which in the case of telemedicine means, for example, that radiologist could report from their homes or patients could enjoy the benefits of telemonitoring.

Thereby, only the health information is transferred in space, thus significant cost-efficiency can be achieved, eliminating the travel of the health professional and the patient.

Moreover, what may be particularly relevant from the patient's point of view is the improvement of accessibility and availability of healthcare. In several cases, it may mean the optimal health care pathway for the patient. In this way, significant health benefits can be booked if the diagnosis or the treatment of the disease is in right time.

Considering the above, the remote monitoring of basic health functions provides an opportunity to reduce the number of physical meetings, which does not necessarily mean the increase of interpersonal distance, as opposed to those areas of telemedicine where there is essentially no relationship between the doctor and patient (see teleradiology).

3. ***The main efficiency issues in telemedicine:*** The effectiveness of telemedicine can primarily be seen in the fact that people working in healthcare do not travel, so there is no loss of working time, no additional costs, which can essentially be traced back to the impact of info-communication technologies.

In addition to time and cost efficiency, telemedicine has positive effect on people's health status through faster diagnosis, treatment, and prevention. Telemedicine can be applied in many fields of medicine, especially in visual diagnostics and remote monitoring of health parameters.

In some situations, it may provide a health service which is similar to the traditional doctor-patient meetings (see teleradiology), but basically, telemedicine is not to replace face-to-face healthcare but to supplement it. In a complementary tool, that is, along with healthcare in a classical sense, it can presumably provide higher quality of healthcare than without it.

Considering that some of the telemedicine services are not applied in everyday healthcare on a system level and are not funded, it is rather an additional task for those who still decide to use it. In addition, the info-communication technologies which are supporting the better accessibility of health professionals – especially specialists – at the same time may contribute to their increased workload. Additionally, it cannot be overlooked that due to the more effective time management, the treatment time per case is significantly less, so in this aspect, the workload of medical specialists may actually be reduced.

4. ***Obstructing and facilitating factors of the diffusion of telemedicine:*** The spread and application of telemedicine are obstructed by several alleged and real factors. These can usually be linked to funding and technical problems, or it can be related to the affected attitudes', qualities, and their talent, or furthermore legal, ethical and privacy concerns. For the health professionals it is a problem that telemedicine is not part of the daily routine, the doctor-patient relationship gets impersonal, and in some cases, the necessary knowledge and skills for using telemedicine are missing. Although, some interviewees – depending on age, specialization, institutional affiliation, interest, experience – weight these factors differently, these are the ones that mostly determine the use of telemedicine.

In contrast, the shortage of physicians could help the adaptation, if it reaches a critical point. It is worth noting that in some areas it was the shortage of physicians that generated the application of telemedicine (see teleradiology), therefore the barriers were reduced somewhat faster. Whereas, in those professional fields, where the aim was to monitor the patients' parameters and to improve the quality of healthcare, there was less progress and often it can only be interpreted as a dedicated health professional's local initiative.

The adaptation is also supported by personal factors, especially the openness of the management and employees, their affinity and ambitions for telemedicine services. Furthermore, the technical background can also be relevant to the implementation of telemedicine.

5. The effects of telemedicine on health inequality: Considering that inequality can be interpreted in many ways and telemedicine has diversified effects, this topic has to be treated in its complexity. Therefore, the effects of telemedicine on inequalities cannot be easily evaluated, because in some cases it reduces, while in other cases it increases the inequalities.

Telemedicine and teleradiology, in particular, can mitigate inequalities caused by human resource shortage because this was the purpose of its set

up. So, people can have access to special clinical expertise in such places, where there is hiatus, and what would be only locally available in centres, and more developed institutions.

Despite this, telemedicine may not provide perfect solution for the scarcity in the number of health professionals and its territorial aspects since fewer doctors have to treat the same number or more patients.

Although telemedicine may not presumably replace the missing doctors, but it can make their work more efficiently, so it can provide optimal distribution of services also in remote areas.

In telemonitoring services, there also should be a health professional who monitors the patients' data and if necessary intervenes, nevertheless, it may reduce the number of the physical doctor-patient meetings. However, those patients, who for some reason – whether it is low income, higher age, the lack of necessary skills and competence required for info-communication technologies, etc. – do not have access to telemedicine (especially for telemonitoring) got into an unequal position compared to those who thus get in many cases additional and better quality healthcare.

Likewise, in certain forms of telemedicine services, the regional differences in infrastructure may influence the quality of service and may restrict the possibility of its use.

6. ***The effect of telemedicine on doctor-patient relationship:*** Telemedicine has a significant impact on the traditional doctor-patient relationship. However, the transformation of doctor-patient relationship can be differently interpreted in certain areas of telemedicine.

In teleradiology, the doctor does not get in any kind of contact with the patient. Although this relationship was limited anyway, it becomes entirely impersonal, which may not be necessarily considered as beneficial. In some cases, additional clinical information about the patients may be necessary. That is not always available and obtaining this information can cause problems, especially in the case of external institutions.

The remote monitoring of health parameters (e.g. blood pressure, blood glucose, etc.) in internal medicine, cardiology and in primary care reduces the number of doctor-patient meetings. However, it still generates quality change in this relationship, as telemonitoring is preceded by a personal meeting and an already evolved trust, which will be further strengthened. It has beneficial effects on the patients' sense of security and health culture, while it supports the doctor in their decision as significant amount of health data will be available about the patient.

7. The effect of telemedicine and health portals on health communities: The various online health portals have significant impact on the patients who ask their questions from a remote place, on health professionals who answer these questions, and on the healthcare system itself and the doctors with whom the patients get ultimately in physical contact. Both the semi-structured interviews and the result of the content analysis highlight that the effects of e-health services cannot be evaluated only as positive or as negative.

We can assess as negative that the patients may get later at the sight of the healthcare system, which can be unfavourable for the patients' health. On the other hand, hypochondriac and people who need „targeted" treatment may appear in the system, which is problematic, because the workload of the health personnel may increase without substantive health gain, or it may generate stress between the healthcare provider and the patient, which also erodes the trust in the doctor-patient relationship.

In addition, it cannot be overlooked that the majority of answers on health portals contain such slogans like it is advisable for the patient to visit a doctor. According to the results of the content analysis, the recommendation to see a doctor appeared in nearly three-quarter of the 2,5 thousand responses. This suggests that these services did not significantly reduce the workload of the health system, thus in this regard we can probably expect less health gain.

In contrast, the beneficial effects are not negligible. The results of the content analysis also showed that nearly one-third of the replies contained therapeutic advices. At the same time, it is necessary to drop the assumptions that this is usually a substitute for a physical doctor-patient meeting.

The advisory role of health portals is unquestionable, which increases the patients' health culture and disease detection, which can generate several positive impacts. First of all, it supports prevention and health preservation, as lifestyle advice and certain therapeutic suggestions facilitate this. It can also contribute to an earlier appearance in the healthcare system, because the patient cares about its health and recognizes certain symptoms and visits some screenings earlier. Thus, the patient got faster diagnose and treatment, so the potential complications may be more likely avoided.

Moreover, it may increase the compliance of the patient, in other words, the cooperation between doctor and patient, if the patient gets information about certain diseases and their treatment. Furthermore, in cases where the patients' need can be satisfied with a simple advice, it may somewhat reduce the number of doctor-patient meetings.

VI. Applicability of the research results

- Both the theoretical and practical results could be used in research related to telemedicine. First of all, it could be used in geography and in sociology, but certain elements could be incorporated in other disciplines such as medicine or IT, as so far only a few studies were analysing the spatial and social impact of telemedicine.
- The research may contribute to the broadening and update the already existing methodology in the field of telemedicine, or maybe to the development of new methods.
- The results of the quantitative and qualitative analysis can be used in health policy decisions and in health development to increase the efficiency of the healthcare system and reduce health inequalities.
- In addition, the results of the semi-structured interviews can be used to inform the healthcare providers and professionals and thus facilitating the adaptation of telemedicine.
- Some parts of the empirical results can be utilized to inform patients who are open to health innovations and the adoption and application of telemedicine services would have beneficial effects on their health status.

VII. Further directions of the research

- In the future, the closer integration of sociological theories dealing with innovation and adaptation with the research methods and empirical results would be important.
- The continuous update of the existing spatial database and the incorporation of new indicators into the qualitative study would be advisable.
- It would be important to expand the number of interviewees and target groups. So far, the interviews were conducted with (medical) specialists, general practitioners, healthcare managers, and IT specialists. However, it may be also relevant to interview other health professionals (assistants, technicians) and also the patients.
- In the future, it would be advisable to confirm the effectiveness of telemedicine with figures. On the one hand, it could mean the analysis of domestic and international academic literature focusing on both cost effectiveness and the quantification of health research

results. On the other hand, conducting surveys with healthcare providers connected to telemedicine would also be useful.

- In relation to the previous issues, the quantitative analysis of some of the already operating telemedicine projects/services and the presentation of „best practices" could also be relevant.
- Furthermore, it may worth to reveal the spatial relations and catchment area of healthcare providers affected by telemedicine using quantitative research methods (questionnaire).

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