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Barriers and facilitators to a health information exchange system between general practitioners and hospitals: a qualitative study in Southern Switzerland

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Summary

BACKGROUND: Health information exchange (HIE) systems are computer tools that healthcare providers use to share patients' medical information electronically. Our study aimed to identify barriers and facilitators perceived by general practitioners (GPs) when using an HIE system in the Canton of Ticino, a region in southern Switzerland.

METHODS: We performed a qualitative study using semi-structured interviews. Ten GPs participated in the study. We analysed transcripts using thematic content analysis and following an abductive approach (a mix of deductive and inductive approaches).

RESULTS: Our findings indicate the following main facilitators of the HIE system: (a) the perception of having to do with a secure system; (b) the possibility of delegating its management to secretaries and healthcare assistants; (c) technical support and training; (d) high quality of the information exchanged; (e) positive impact on clinical practice; and (f) regional context. However, major challenges still persist, and GPs reported the following main barriers to using an HIE system: (a) a frequent lack of all the patient documentation they needed; (b) no effective workflow improvements; and (c) lack of some technical features.

CONCLUSIONS: The results of our study provide a qualitative perspective of opinions and experiences of GPs that can inform improvements of the current HIE system and future federal and cantonal HIE initiatives in Switzerland and elsewhere.

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Introduction

The exchange of health information enables continuity of care [1]. In the last decades, the constant increase of medical knowledge and specialisation [2], the proliferation of organisations providing healthcare [3] and the emergence of electronic patient records [4] has generated a vast amount of digital patient data scattered across different locations and providers. Health information technology has the potential to assist healthcare providers in managing health information [2]. In particular, health information exchange (HIE) systems are health information technology tools used by healthcare providers to share quickly, securely and efficiently patients' information [5].

Recent systematic reviews that have explored the topic of HIE systems have identified barriers and facilitators to their implementation and usage on the provider side [6–8]. According to these studies, HIE systems offer the potential to use resources more efficiently and improve the quality of care. However, Hersh et al. [6] recognise that the heterogeneity of systems, purposes, contexts and outcomes examined in the studies they reviewed made it difficult to predict how implementation pans out in real-world settings.

The aim of our study was to identify which barriers and facilitators general practitioners (GPs) perceive when using an HIE system in the Canton of Ticino. We decided to focus on GPs because their role of coordinating patient care requires access to up-to-date and complete patient documentation from all the different organisations and specialists involved.

Materials and methods

Our qualitative research followed the Consolidated Criteria for Reporting Qualitative (COREQ) Research Guidelines [9].

Setting and participants

We conducted a qualitative study involving 10 GPs of the Canton of Ticino, in southern Switzerland, using individual face-to-face semi-structured interviews. We used a pragmatic approach to sample size. According to the experience of most qualitative researchers [10] and considering that GPs working in the Canton of Ticino are a relatively homogenous group, 10 interviews were taken to be an adequate number to answer our research question. This a priori decision was confirmed by the fieldwork, as da-

ta saturation was achieved. We recruited participants by randomly selecting potential interviewees from 354 GPs based in the Canton of Ticino who were voluntarily registered in the EOCnet, an HIE portal developed and provided to healthcare professionals by the Ente Ospedaliero Cantonale (EOC) (hospitals of southern Switzerland) (table 1).

Data collection

The lead author (NSC), a physician trained in qualitative methods, conducted all the in-person interviews in Italian, the official language spoken in the study region. Interviews were transcribed verbatim and the quotes identified as the most meaningful by the researchers were selected and translated into English. We formulated the specific questions of the interview guide (see appendix) in line with the overall research aim, and on the basis of a literature review focused on the factors affecting the use of HIE systems [11]. The topic guide was pilot-tested using the "expert assessment technique" [11] with three independent medical informatics specialists not involved in the study.

Data analysis

We analysed the data using thematic content analysis, following the four-step process [12] defined by Green and Thorogood [12]. The lead author (NSC) (1) familiarised himself with the transcripts, (2) identified codes and themes, (3) developed the list of codes to be applied to the whole dataset and (4) organised codes and themes. At the end of each step the authors met to discuss and review the results before undertaking further analysis. In the last meeting, the gathered extracts of data from the same codes were rediscussed to reach a final consensus. The analysis of transcripts was carried out in Italian using a Computer Assisted Qualitative Data Analysis software (ATLAS.ti [13]).

Table 1:
The main characteristics of the HIE portal EOCnet.

It enables the safe exchange of patient documentation, between healthcare providers (e.g., GPs, medical specialists, private clinics, and nursing homes).
It provides a bi-directional documentation exchange (from hospitals to healthcare professionals and vice versa).
It is based on a voluntary subscription.
It is accessible via the internet from anywhere.
Users can log in through either the Health Info Net (HIN) or a one-time password sent by SMS.
Patient documentation is stored for 20 days and then removed.

As explained by Green and Thorogood, an insightful qualitative analysis should seek connections "within the data and between them and the world outside" [12]. To achieve this objective we applied an abductive approach [14] to the thematic content analysis. This hybrid form of reasoning, sometimes also called complementary, combines deductive and inductive analysis and provides a more comprehensive understanding of data, allowing novel insights to emerge from the context while comparing the data collected to pre-existing research [15,16]. We created an a priori coding scheme that adapted the barriers and facilitators identified by Eden et al. [7] to the HIE system in use.

In the analysis, we proceeded as follows. Firstly, a deductive approach to our data set, informed by previous knowledge about the topic, allowed us to test findings that had already been described in the literature regarding HIE system barriers and facilitators. We related and compared the setting studied with a more general understanding of the topic to reveal similarities and differences. Secondly, we followed an inductive approach that provided "thick" context-related descriptions by GPs of anecdotes, peculiar issues and common experiences [12]. Finally, we integrated findings of both approaches to reach conclusions comparable to other settings, allowing for the development of new contextual insights.

Ethics

After evaluating the project, the local ethics committee confirmed that it did not need approval because it did not fall within the scope of the Human Research Act according to Article 2 [17]. Before conducting the interviews, the lead researcher explained the project objectives and purpose to the participants and all signed an informed consent form.

Results

Characteristics of participants and interviews

None of the GPs we contacted refused to participate. Table 2 shows the characteristics of participants and interviews. In total, we interviewed 10 GPs, three women and seven men, from 15 May to 4 July 2019. Participants were between 37 and 51 years old (average age of participants: 44 years). Interviews ranged from 17 to 29 minutes (average length: 22 minutes). Among the interviewees, the earliest adopter of the HIE system was in September 2017 and the latest adopter was in January 2019.

Table 2:
Baseline characteristics.

Interviewee	Gender	Age	Interview date	Interview duration (min.)	HIE system use from
1	M	37	15 May 2019	22	January 2019
2	M	46	22 May 2019	17	May 2018
3	M	47	28 May 2019	23	June 2018
4	M	51	31 May 2019	26	February 2018
5	M	42	31 May 2019	20	September 2017
6	F	39	4 June 2019	25	December 2017
7	F	44	6 June 2019	19	October 2017
8	M	49	13 June 2019	17	November 2018
9	F	46	26 June 2019	29	January 2018
10	M	37	4 July 2019	24	July 2018

Barriers and facilitators of the HIE system

We identified nine overall themes. Three outline the perceived barriers and six the perceived facilitators for the use of the HIE system. We grouped the themes into four groups. The first three, "Completeness of information", "Organisation and workflow" and "Technology and user needs", come from the categorisation created by Eden et al. [7] and are based on the framework that we followed to collect and analyse the data in the deductive analysis. The fourth group includes two facilitators emerging from the inductive analysis (table 3).

Completeness of information

Theme 1: Lack of patient documentation (barrier)

Missing or limited patient documentation in the HIE system was one of the barriers reported by all interviewees. GPs complained about the lack of a single HIE system where they can find all patient documentation, regardless of where it was created.

As described by one participant, the resulting "double management", in part paper-based and in part electronic documentation, made it complex to collect all the data needed by GPs for their consultations.

Theme 2: Good feeling about privacy and security (facilitator)

As reported by Eden et al. [7], concerns about privacy and security undermine data sharing, contributing to incomplete information. In our study, all 10 interviewed GPs considered the HIE system they use to be a secure platform to send and receive patient documentation.

One reason GPs expressed a positive feeling about privacy and security is that most of them logged into the system through the Health Info Net (HIN) [18], an encryption system provided by a medical service company specialised in the secure exchange of information compliant with data protection rules.

Two interviewees pointed out that a disadvantage of procedures to ensure security is that they are time-consuming. However, as they recognised the importance of patient privacy, they agreed to spend time for the sake of security.

Finally, two GPs reported negative experiences with their patients' privacy. In both cases, they received documentation about a patient that had been forwarded to the wrong GP. However, they did not consider these incidents as potential barriers to the use of the HIE system as they also happened when using mail or fax.

Table 3:
Themes and related quotations.

	Barriers	**Facilitators**
Completeness of information	**Lack of patient documentation**	**Good feeling about privacy and security**
	"If there were a system where I could access all patient documentation created by hospital X or laboratory Y, it would be easier". (GP_3)	*"I feel it [EOCnet] is a secure system… obviously, in computer science, we know that nothing can be totally secure… but I think that data protection is adequate for the risks on this platform". (GP_4)*
	"To date, this double management, computer-based and paper, is still a little heavy". (GP_7)	*"[…] especially because you have to log-in through a HIN account which, they explained, is the safest and is used by all physicians". (GP_2)*
		"I don't know how many times it happened, but with the fax, we also happened to receive a fax that was not intended for us… and well… we sent it back to the sender". (GP_09)
Organisation and workflow	**Lack of impact on workflow**	**Possibility of being used by secretaries and healthcare assistants**
	"So, if I have to make a comparison with the document that arrives by fax or mail, it is more or less the same… they [secretaries] print it and show me the digital document if there is something in particular […]". (GP_8)	*"Secretaries use it, they download the documents and save them in the EHR". (GP_9)*
	"[…] I open the system, I open the document, I have to save it, saving takes place in two stages… then I have to open the patient file and import the document into the EHR". (GP_7)	*"Only my secretaries use the system, I deal with clinical activity, and they do the rest of the work... that's it". (GP_2)*
		Technical support and training
		"we had a meeting, we were a dozen GPs and we had training with a computer technician". (GP_7)
		"I remember there was a user guide, I read it, and then I saw that the system was quite user-friendly, so I didn't need to learn too much because it is quite simple". (GP_1)
Technology and user needs	**Lack of technical features**	**Type and quality of exchanged information**
	"The documentation remains available for a short period of time […] you'll lose medical history, this way! […] This is a great flaw of this system". (GP_6)	*"[…] the letter I receive through the system is very detailed, with all the diagnoses and with everything that has to be done. So that's enough for me". (GP_2)*
	"Therefore, perhaps we need something that allows us to transfer data from it [the HIE system] to the EHR rather than the pdf format, which is not easily transferable data". (GP_5)	
	"[…] downloading images takes a long time". (GP_8)	
Additional themes		**Positive impact on clinical practice**
		"We had to wait longer before […] now, the whole process, as it is much faster, is inevitably also beneficial for the patient". (GP_2)
		"[…] to prevent the TSH [1] test from being repeated a hundred times, when the patient has just done it at the hospital a week earlier". (GP_7)
		The "Canton effect"
		"I discovered the HIE system at the hospital". (GP_4)

[1] The Thyroid Stimulating Hormone (TSH) test is a blood test that measures TSH. TSH levels that are too high or too low indicate that the thyroid gland does not work correctly.

Organisation and workflow

Theme 3: Lack of an effective impact on workflow (barrier)

Seven interviewees reported that, since the adoption of the HIE system, the workflow in their practice has not improved, and although some procedures have changed (e.g., from scanning paper documents to downloading digital documents), the complexity and the time required by the processes has remained almost unchanged.

In addition, two participants noticed a worsening of the workflow in their practices. The former reported that there was an increase in the time needed to archive the digital documents exchanged through the HIE system in the Electronic Health Record (EHR).

In particular, only one GP saw an improvement in the workflow in terms of time savings after the adoption of the HIE system.

Theme 4: Possibility of being used by secretaries and healthcare assistants (facilitator)

Seven GPs stated that they delegated the management of the HIE system to their secretaries or medical assistants, whereas the other three used the system themselves.

All participants knew how the system worked and could use it independently. However, they preferred to delegate administrative tasks to their secretaries or assistants, to focus exclusively on clinical activity.

Remarkably, among the GPs who personally used the system, two were willing to delegate its management if required, whereas one only did not want assistants to administer the system as s/he was scared of wasting information or time.

Theme 5: Technical support and training (facilitator)

All participants considered the presence of adequate technical support and training as a facilitator for the use of the HIE system.

However, it should also be noted that five participants, who considered the system to be user-friendly and simple to use, did not want personal training and preferred to read the user guide.

As far as technical support is concerned, although all participants reported that they knew who to contact to solve technical problems, only two GPs experienced minimal issues.

Technology and user needs

Theme 6: Lack of technical features (barrier)

Participants reported that the lack of certain functions is a barrier to using the HIE system. Two GPs considered the storage period of patient documentation too short (in the HIE system used by the interviewees, the patient documents are kept for 20 days and then removed).

Also, the participants considered the lack of integration between the HIE system and the EHR to be problematic and time-consuming. GPs reported that they downloaded documents from the HIE system and then uploaded them manually (e.g., through the drag-and-drop or cut-and-paste features) into the EHRs. Participants described these steps as complicated and time-consuming.

Participants also perceived the time that radiological images (especially magnetic resonance imaging and computed tomography) required to be viewed as a barrier. The reason was that radiological images needed to be downloaded to GPs' personal computers and this procedure was time-consuming.

Theme 7: Type and quality of the information exchanged (facilitator)

GPs felt that the type of documents exchanged through the HIE system provided all the information they needed to treat the patient. Furthermore, they reported that the quality of the reports was extremely high. Substantially, the interviews showed that the GPs found the necessary and sufficient information for their consultations in the documents exchanged through the HIE system.

Additional themes

Theme 8: Positive impact on clinical practice (facilitator)

After the implementation of the HIE system, all participants reported that obtaining patient documents was much faster than before, when they received letters by mail.

As most GPs stated, after the adoption of the HIE system, the significant reduction in the time needed to receive patient documents allowed improvement of clinical activities and patient satisfaction.

With regard to the timeliness in receiving patient documents, two interviewees also mentioned a potential impact of the HIE system on cost-savings and patient risk reduction.

Theme 9: The "Canton effect" (facilitator)

This theme is named after the Swiss regions called "cantons". Participants found that working in a small region was one of the main facilitators for both the adoption and use of the HIE system. The fact that GPs in the Canton of Ticino knew each other and the institution (EOC) that developed and encouraged the adoption of the HIE system they used, was seen as an advantage in terms of trust and dissemination of information. Some GPs found out about the existence of the HIE system by word of mouth.

Discussion

This qualitative study aimed to identify barriers and facilitators perceived by GPs when using an HIE system in a region of southern Switzerland. Nine themes became apparent in the interviews, each describing a barrier or facilitator identified by the GPs.

Among the barriers identified by our participants was the lack of all the patient documentation they needed, missing improvements in workflow, and a lack of technical features (such as the integration between the HIE system and the EHR). These findings are consistent with some of the barriers described in the study by Eden et al. [7], who pointed out that incomplete patient data and poor workflow hindered the use of HIE systems.

Our research found that all participants perceived the platform to be secure, which was one of the main facilitators to the use of the HIE system. Other studies indicate the existence of concerns over privacy and security. In their systematic review, Fontaine et al. [19] reported that privacy issues were perceived to be barriers to the use of

HIE systems in primary care practices. Similarly, in a survey, Wright et al. [20] found that 71% of participating physicians expressed concerns about privacy and security of HIE systems. Possible explanations for the differences between these findings and our study might be the high standards of data protection and the absence of major violations of patient health data privacy in Switzerland, in contrast to the United States, where these studies were conducted [20]. This highlights the importance of privacy and security aspects and the need to align HIE projects with data protection legislation [21].

The lack of technical features and improvements to workflow identified by the participants in our study, and the perceived need to improve interoperability between HIE systems and GPs' EHRs, corroborates findings by Rudin et al. [22], who recommend that physicians, informaticians and trainers work together to develop and integrate the HIE system into clinical workflows [22]. The other two facilitators indicated by GPs in our study were the possibility of delegating the management of the HIE system (e.g., to healthcare assistants and secretaries), and technical support and training. These elements contributed to reducing the burden of the HIE system on GPs' activities, not only at the beginning of its implementation in their practice (training), but also subsequently (management by delegates and technical support). These findings are consistent with the study by Eden et al. [7], which found that the use of delegates is a way to save physicians' time; they also mention the importance of ongoing training and the presence of sufficient technical support.

Two other facilitators reported by our participants were the high quality of the content of the documents exchanged and the positive impact of the HIE system on clinical practice. Unlike Eden et al. [7], who pointed out that, among the barriers they identified, exchanged documents did not meet the needs of users (e.g., information was not sufficiently filtered, reports were too long), our study found that GPs were satisfied with quality in terms of completeness and clarity of information received. In addition to quality, another critical element that promoted the use of the HIE system in our study was the speed at which information was sent and received. This factor was considered to be a potential driver of improvements in clinical outcomes, risk reduction and patient satisfaction. Moreover, our participants also described other significant examples, such as the possibility of avoiding the duplication of tests or following up earlier after hospital discharge. These findings are consistent with previous studies. Hincapie et al. [23] and Messer et al. [24] found that HIE systems improved patient care by helping physicians make better decisions and developing a patient-physician relationship. Furthermore, in a systematic review on HIE systems, Hersh et al. [6] found evidence of a positive effect not only on the quality of care but also in terms of saving resources (e.g., reduction in laboratory and imaging tests). Although our study focused on exploring the barriers and facilitators of HIE systems according to GPs, future studies should also investigate whether the positive impact of HIE systems on clinical aspects outweigh potential barriers and adoption costs [25, 26].

A further element that emerged as an important facilitator in our research, both for the adoption and use of the HIE system, was what we called the "Canton effect". This means that all GPs considered the small regional context where they were working as a key factor, not only for finding out about the existence of the HIE system, but also for exchanging experiences and informal feedback on its characteristics and impact on their daily activities. A similar facilitator was reported by Yaraghi et al. [27] in the USA. Their study highlighted the importance of informal feedback (e.g., word of mouth) among physicians to increase adoption of the HIE system in other practices [27].

Our study has several limitations worth noting. Apart from the small sample size, qualitative interviews only provide information on what people said and how they described their experiences, but cannot capture what they actually did [28]. However, since the interview questions did not cover sensitive topics, it is safe to assume that GPs were sincere and transparent in their answers. Since the management of the HIE system was often shared or, in some cases, totally delegated to healthcare assistants and secretaries, another limitation of this study is that some GPs were not always aware of all the functions of the HIE. A fourth limitation is that the average age of the participants (44 years) was about 10 years lower than the average age of Swiss GPs [29], suggesting that younger GPs might be more likely to adopt and accept new technologies. Finally, this study focused only on GPs, ignoring other healthcare professionals, such as pharmacists, physiotherapists and home care nurses who are also involved in the health information exchange process.

Our study also has several strengths. It provides information on first-hand perceptions of barriers and facilitators of the HIE system in use in the Canton of Ticino, which may be of relevance to HIE systems used in other parts of Switzerland and elsewhere. The study is also timely. Switzerland has recently started a national HIE project, which will be progressively implemented in 2021 [30]. The findings of our study can inform these ongoing developments.

This study is the first that addresses barriers and facilitators for HIE systems in the Canton of Ticino, Switzerland. Based on our findings, there are several elements allowing GPs to use the HIE system, including confidence in the security of the system protection of data privacy. This positive factor is crucial at a time when sharing information for clinical practice focuses on improving healthcare quality and costs, especially during the COVID-19 pandemic. The results also indicate that a few major barriers still persist. On closer examination, it seems that the availability of complete patient documentation is one of the main challenges that will need to be resolved.

Conflict of interest

Both authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. Nicolò Saverio Centemero was employed at the Ente Ospedaliero Cantonale during the data collection. Bernd Rechel declares no competing financial interest or personal relationships that could have appeared to influence the work reported in this paper.

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References

1. van Walraven C, Taljaard M, Bell CM, Etchells E, Zarnke KB, Stiell IG, et al. Information exchange among physicians caring for the same patient in the community. CMAJ. 2008 Nov;179(10):1013–8. http://dx.doi.org/10.1503/cmaj.080430. PubMed. 1488-2329
2. Hoyt RE, Hersh WR, Bernstam EV. Overview of Health Informatics, in: R.E. Hoyt, W.R. Hersh (Eds.), Heal. Informatics Pract. Guid., 7th ed., lulu.com, 2018: pp. 1–27.
3. Haggerty JL, Reid RJ, Freeman GK, Starfield BH, Adair CE, McKendry R. Continuity of care: a multidisciplinary review. BMJ. 2003 Nov;327(7425):1219–21. http://dx.doi.org/10.1136/bmj.327.7425.1219. PubMed. 1756-1833
4. Sittig DF, Wright A, Ash J, Singh H. New Unintended Adverse Consequences of Electronic Health Records. Yearb Med Inform. 2016 Nov;2016(1):7–12. http://dx.doi.org/10.15265/IY-2016-023. PubMed. 2364-0502
5. The Office of the National Coordinator for Health Information Technology (ONC). What is an electronic health record (EHR)? Healthit.Gov. (2013). https://www.healthit.gov/faq/what-electronic-health-record-ehr (accessed October 20, 2018).
6 W. Hersh, A. Totten, K. Eden, B. Devine, P. Gorman, S. Kassakian, S.S. Woods, M. Daeges, M. Pappas, M.S. McDonagh, Health Information Exchange, 2015. https://doi.org/ http://dx.doi.org/10.23970/AHRQEPCERTA220. .
7. Eden KB, Totten AM, Kassakian SZ, Gorman PN, McDonagh MS, Devine B, et al. Barriers and facilitators to exchanging health information: a systematic review. Int J Med Inform. 2016 Apr;88:44–51. http://dx.doi.org/10.1016/j.ijmedinf.2016.01.004. PubMed. 1872-8243
8. Kruse CS, Marquez G, Nelson D, Palomares O. The use of health information exchange to augment patient handoff in long-term care: A systematic review. Appl Clin Inform. 2018 Oct;9(4):752–71. http://dx.doi.org/10.1055/s-0038-1670651. PubMed. 1869-0327
9. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007 Dec;19(6):349–57. http://dx.doi.org/10.1093/intqhc/mzm042. PubMed. 1353-4505
10. Guest G, Bunce A, Johnson L. How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. Field Methods. 2006;18(1):59–82. http://dx.doi.org/10.1177/1525822X05279903. 1525-822X
11. Barriball KL, While A. Collecting data using a semi-structured interview: a discussion paper. J Adv Nurs. 1994 Feb;19(2):328–35. http://dx.doi.org/10.1111/j.1365-2648.1994.tb01088.x. PubMed. 0309-2402
12. Green J, Thorogood N. Qualitative Methods for Health ResearchB, 3rd ed., SAGE Publications, London, 2013.
13 ATLAS.ti, (2018).
14. Krippendorff K. Content Analysis. An introduction to Its Methodology, 4th ed., SAGE PublicationsSage UK: London, England, 2018.
15. Graneheim UH, Lindgren BM, Lundman B. Methodological challenges in qualitative content analysis: A discussion paper. Nurse Educ Today. 2017 Sep;56:29–34. http://dx.doi.org/10.1016/j.nedt.2017.06.002. PubMed. 1532-2793
16. Fereday J, Muir-Cochrane E. Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. Int J Qual Methods. 2006;5(1):80–92. http://dx.doi.org/10.1177/160940690600500107. 1609-4069
17. The federal Council. Federal Act on Research involving Human Beings, Portal Swiss Gov. (2014). https://www.admin.ch/opc/en/classified-compilation/20061313/index.html (accessed March 23, 2019).
18. Health Info Net. Information about Health Info Net AG (HIN), Heal. Info Net. (2012). https://www.hin.ch/wp-content/uploads/2012/04/Information-about-Health-Info-net-0.1.pdf (accessed July 14, 2019).
19. Fontaine P, Ross SE, Zink T, Schilling LM. Systematic review of health information exchange in primary care practices. J Am Board Fam Med. 2010 Sep-Oct;23(5):655–70. http://dx.doi.org/10.3122/jabfm.2010.05.090192. PubMed. 1558-7118
20. Wright A, Soran C, Jenter CA, Volk LA, Bates DW, Simon SR. Physician attitudes toward health information exchange: results of a statewide survey. J Am Med Inform Assoc. 2010 Jan-Feb;17(1):66–70. http://dx.doi.org/10.1197/jamia.M3241. PubMed. 1527-974X
21. Vayena E, Haeusermann T, Adjekum A, Blasimme A. Digital health: meeting the ethical and policy challenges. Swiss Med Wkly. 2018 Jan;148(34):w14571. http://dx.doi.org/10.4414/smw.2018.14571. PubMed. 1424-3997
22. Rudin R, Volk L, Simon S, Bates D. What affects clinicians' usage of health information exchange? Appl Clin Inform. 2011 Jan;2(3):250–62. http://dx.doi.org/10.4338/ACI-2011-03-RA-0021. PubMed. 1869-0327
23. Hincapie AL, Warholak TL, Murcko AC, Slack M, Malone DC. Physicians' opinions of a health information exchange. J Am Med Inform Assoc. 2011 Jan-Feb;18(1):60–5. http://dx.doi.org/10.1136/jamia.2010.006502. PubMed. 1527-974X
24. Messer LC, Parnell H, Huffaker R, Wooldredge R, Wilkin A. The development of a health information exchange to enhance care and improve patient outcomes among HIV+ individuals in rural North Carolina. Int J Med Inform. 2012 Oct;81(10):e46–55. http://dx.doi.org/10.1016/j.ijmedinf.2012.07.009. PubMed. 1872-8243
25. Cochran GL, Lander L, Morien M, Lomelin DE, Sayles H, Klepser DG. Health care provider perceptions of a query-based health information exchange: barriers and benefits. J Innov Health Inform. 2015 Jun;22(2):302–8. http://dx.doi.org/10.14236/jhi.v22i2.135. PubMed. 2058-4563
26. Sadoughi F, Nasiri S, Ahmadi H. The impact of health information exchange on healthcare quality and cost-effectiveness: A systematic literature review. Comput Methods Programs Biomed. 2018 Jul;161:209–32. http://dx.doi.org/10.1016/j.cmpb.2018.04.023. PubMed. 1872-7565
27. Yaraghi N, Du AY, Sharman R, Gopal RD, Ramesh R. Health information exchange as a multisided platform: Adoption, usage, and practice involvement in service co-production. Inf Syst Res. 2015;26(1):1–18. http://dx.doi.org/10.1287/isre.2014.0547. 1047-7047
28. Chantler T. Qualitative interviewing, in: M.A. Durand, T. Chantler (Eds.), Princ. Soc. Res., 2nd ed., Open University Press, Maidenhead, 2014: pp. 50–62.
29. Cartier T, Senn N, Cornuz J, Bourgueil Y. Switzerland, (2015). https://www.ncbi.nlm.nih.gov/books/NBK459012/ (accessed 2021 August 21).
30. eHealth Suisse, What is the EPR? EHealth Suisse. (2018). https://www.patientendossier.ch/en/health-professionals/briefly-explained (accessed 2019 August 24).

Appendix: Topic Guide

First of all, thank you so much for participating in this project.

Before starting, are there any questions you would like to ask?

As you know, this conversation will be recorded. Do you agree?

So, let's start the interview. For a start, I would like to ask you a couple of general questions. Then, I will go on discussing more specific aspects.

1. How did you hear about the existence of the EOCnet? (from colleagues, the EOC, at a local symposium, meeting, etc. where the EOCnet was presented, etc.)
2. Could you tell me why you decided to adopt the EOCnet?
3. Could you tell me a little about your experience with HIE systems in general?

Ok, and now let's go on with more specific questions. I will tackle three broad themes in the following order: "Completeness of Information", "Organisation and Workflow" and "Technology and User Needs".

Completeness of information

1. How do you feel about the HIE system privacy and security?
2. What would your main concerns (if any) about privacy and security be?
3. Have you had any bad experiences with these aspects?
4. Do you find all the information you need about your patients? (e.g. patients outside the HIE system catchment area)

Organisation and workflow

1. Do you use the HIE system yourself or do your secretaries/assistants use it? (e.g. single login)
2. Did you and your staff receive appropriate training?
3. After adopting the HIE system, what do you think of the technical support? Have you ever needed it? If so, what was your experience?
4. Has your daily workflow changed in any way since you adopted the HIE system? I mean, positively and/or negatively (e.g. time, processes, etc.).
5. Has your clinical work changed in any way since you adopted the HIE system? I mean, positively and/or negatively (e.g. patient outcome, less/more mistakes etc.).

Technology and user needs

1. Considering the technical features, what do you like and dislike about the HIE system? (e.g. usability, etc.)
2. In your opinion, what features of the current system should be improved in the next few years? And with what priority?

I would like to conclude this interview with a funny question: let's say you find the Aladdin Lamp, what are your three wishes about an ideal HIE system? For example, "I would like the HIE system to be capable of or be more…etc."

The interview is over. Thanks for your cooperation. Is there anything else you would you like to add?