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Primary care physician eHealth profile and care coordination: a cross-sectional study

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Summary

BACKGROUND: Digital health holds promise for enhancing care coordination and supporting patient self-management. However, various barriers, including at the healthcare professional level, hinder its adoption. This cross-sectional study explored the eHealth profile of primary care physicians and its relationship with care coordination.

METHODS: As part of "The Commonwealth Fund's 2022 International Health Policy Survey of Primary Care Physicians in 10 Countries", 1114 physicians in Switzerland completed a questionnaire on their sociodemographic and workplace characteristics, digital health use and care coordination practices. Based on their responses concerning the modality, frequency and application of digital health tools, we created a digital health score. Based on responses describing the collaboration with specialists and paramedical health professionals, we created a care coordination score. The associations between both scores were assessed using stratified analyses and multiple linear regression.

RESULTS: Among the 1114 participants (46% women, mean age 52 years), 83% used electronic patient records, 96% used teleconsultations for less than 5% of consultations, and 63% never used connected health tools to monitor patients with chronic diseases. Further, 16% allowed online appointments, 20% online medical prescriptions, 52% the possibility of electronically communicating lists of medications with other healthcare professionals, and 89% the possibility of email or web communications with the patient. The eHealth score was positively associated with the number of weekly working hours, being an internal medicine specialist or practising physician, the number of full-time equivalents in the practice and being in a group practice setting. The higher the eHealth profile score, the higher the care coordination score.

CONCLUSION: Digital health and care coordination were positively associated. This could underscore the potential benefits of digital health in enhancing collaborative and interprofessional care practices.

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Introduction

Digital health, or eHealth – a vast field encompassing mobile health (mHealth), health information technology, wearable devices, telehealth and telemedicine – is changing the practice of medicine [1]. Growing evidence suggests that digital health could help manage chronic conditions such as diabetes [2] and cardiovascular diseases [3] and enhance patient well-being [4]. It could also ease the delivery of health services through digital communication technologies [5] and improve medication adherence [6], which is crucial in addressing the challenges posed by increasing polypharmacy related to the rising burden of chronic diseases in the ageing population [7].

Care coordination is a critical component of a strong primary care system [8], and the digitalisation of medicine could help care coordination between healthcare professionals [5]. Patients increasingly can digitally monitor their health and share health data with healthcare professionals, strengthening their empowerment [9]. Access to digital tools, notably through primary healthcare providers, could be one element strengthening care coordination, notably to foster team-based and patient-centred care for the management of chronic diseases [10]. However, the acceptance of digital health by healthcare providers, including primary care physicians, is notably hindered by concerns that it may disrupt the therapeutic relationship with the patient and by the lack of evidence on its benefits and risks [11].

A survey carried out among Finnish physicians showed that 46% felt that digital health could promote an active role for patients in their care and 44% thought that it could improve their access to information [12]. In Germany, another survey showed that around 68% of doctors were positive about mHealth applications, but only 14% had ever prescribed them [13]. The American Medical Association reported that all forms of digital health tools have increased over recent years, from teleconsultations to clinical

ABBREVIATIONS

CWF:	Commonwealth Fund
FMH:	Foederatio Medicorum Helveticorum
eHealth:	digital health
IHP:	International Health Policy
mHealth:	mobile health

decision tools and workflow improvements. Furthermore, the doctors surveyed felt that digital health was improving clinical outcomes, diagnostic capabilities and care coordination [14]. In Switzerland, an "eHealth barometer" survey is regularly carried out among doctors and other healthcare professionals. In 2024, it revealed that the perceived potential for eHealth and the use of electronic systems to store and manage patient data were increasing. However, this survey does not examine the relationship between digital health and care coordination [15].

A better understanding of the use of digital health in patient care by primary care physicians and its relationship with care coordination is thus important. Using data from a large survey of primary care physicians, we aimed to (1) describe the digital health use of primary care physicians in Switzerland and its associations with sociodemographic characteristics and (2) assess the relationship between a digital health score (a score built on various items studying the physicians' use of and involvement in digital health) and the degree of care coordination.

Materials and methods

Study design

We conducted a secondary analysis of the 2022 International Health Policy (IHP) Survey of the Commonwealth Fund (CWF). The CWF is a non-profit foundation in the USA that has been conducting IHP surveys since 1998 to compare the health system performances of the USA and other high-income countries. The methodology of the IHP has been described elsewhere [16]. Since 2010, Switzerland has been one of the 11 participating high-income countries (with Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, the United Kingdom and the USA). Three target groups are surveyed every 3 years: the resident population aged 18 years and over, the resident population aged 65 years and over, and primary care physicians [17]. In 2022, the IHP survey of primary care physicians, on which our analysis was based, was conducted in 10 countries (Norway did not participate).

Participants

We used the data from the Swiss participants of the 2022 IHP survey. In Switzerland, the most common training to become a primary care physician is a specialisation in internal medicine or paediatrics, both lasting 5 years. Another possibility is to become a "practising physician": a physician following shorter training, generally 3 years, after which they can set up practice in an outpatient setting [18]. In Switzerland, a large and growing share of physicians is trained abroad. The Swiss Medical Association (FMH [Foederatio Medicorum Helveticorum]) provided the CWF with a random sample of 4000 physicians, chosen from a pool of 8354 physicians registered in 2022, providing outpatient care and with a specialist title of internal medicine (n = 5891), practising physician (n = 1175) or paediatrician (n = 1288). Some 1114 participants completed the questionnaire and constituted our study population (participation rate: 28%). This sample did not include specialists working in a hospital. The flowchart of the participants included in the study is shown in figure 1.

Data collection and measurement

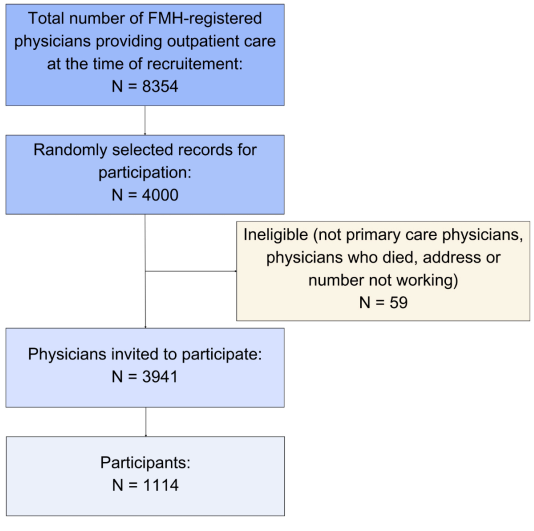
Between March and May 2022, the physicians completed an online questionnaire about their personal and workplace characteristics, their use of digital health and their care coordination. The questionnaire was designed by the CWF, and the data collection in Switzerland was carried out by the company demoSCOPE. The questionnaire aimed to provide information on the physicians' individual and workplace characteristics, care coordination, digital transformation, and evaluation of their work and the healthcare system in general [19].

For our analysis, we used the following physician and workplace characteristics: age, sex, degree of urbanisation of the practice location, speciality, weekly working hours, number of patients seen per week, type of practice setting (a group practice setting means a practice with at least two physicians) and number of full-time equivalents in the practice.

The assessment of physicians' digital health use was based on their responses to 10 questions about teleconsultation, the use of connected health tools, electronic patient records and various online services for patients. We built the digital health score based on those items by assigning a value of 0 or 1 to each response and adding these values to obtain a score ranging from 0 to 10. The higher the digital health score, the higher the physicians' use of and involvement in digital health.

A care coordination score was built based on the responses to five questions about the presence of nurses or case managers to help manage chronic conditions, communication with specialists, and collaboration with home care providers and social services. We built the care coordination score in the same way as the digital health score. Since only five questions on care coordination were available, the score ranged from 0 to 5. We assumed that the higher the care coordination score, the higher the physicians' coordination with other healthcare professionals. The scores were created based on background knowledge and authors' expertise because no score exists for physicians' digital health use or care coordination based on the IHP data.

Figure 1: Flowchart of participants (n = 1114).



Statistical analysis

For the first aim of this study, we reported descriptive statistics on the characteristics, digital health use and care coordination of the primary care physicians. We presented the continuous variables as mean and standard deviation (SD) and categorical variables as number and percentage (%).

For the second aim, we assessed the association between the digital health score and the care coordination score. We first stratified the data by physician characteristics. We then modelled the association between the two scores through two linear regression analyses: one was unadjusted, and the other was adjusted for age, sex, medical speciality and type of practice setting.

Very few data were missing. For both scores, when the answer to a question was missing, we assigned a value of 0.

Ethical approval

Ethical approval was obtained to conduct the IHP of the CWF, and no additional approvals were required for secondary analysis of IHP survey data.

Results

The characteristics of the 1114 physicians are shown in table 1. The mean age was 52 years, and 46% were women. Most physicians were German-speaking (70%), had an internal medicine speciality (73%), worked in an urban setting (70%) and worked in a group practice (65%).

Descriptive statistics of the care coordination of physicians are shown in table 3. Most physicians (79%) shared patient history with specialists during referral 75% of the time or more and shared (59%) or received (71%) patient information from homed-based nursing care 50% of the time or more. Some 56% were collaborating with nurses or case managers inside or outside the practice to help chronic disease management, and 94% had some collaboration with social services. The mean digital health score was 4.1 (SD: 2.0), and the median score was 4 (interquartile range [IQR]: 2 to 6). The care coordination score ranged from 0 to 5, with a mean of 3.6 (SD: 1.3) and a median of 4 (IQR: 3 to 5). Both scores increased as the number of weekly working hours increased (see stratified analyses in appendix table S1). Physicians' speciality was associated with both scores, with paediatricians having the lowest means in both scores and practising physicians having the highest digital health scores. The digital health score was also associated with more full-time equivalent staff in the practice and being in a group practice setting compared to solo practice.

Figure 2 shows the mean care coordination score stratified by physicians' digital health score. The higher the care coordination score, the higher the digital health score. Table 4 shows the regression between the digital health score and the care coordination score, unadjusted and adjusted for age, sex, medical speciality and group practice setting. We found a positive association between both scores (regression coefficient 0.06, 95% confidence interval [CI] 0.03–0.10, p = 0.001).

Table 1:
Characteristics of primary care physicians and practice care settings (n = 1114).

Characteristic		n (%)
Age [years], mean, SD		52, 10.6
Sex	Female	516 (46)
	Male	598 (54)
Language	German	780 (70)
	French	242 (22)
	Italian	85 (8)
	Rhaeto-Romansch	7 (1)
Community type	Urban	781 (70)
	Intermediate	201 (18)
	Rural	132 (12)
Medical specialty	Internal medicine	812 (73)
	Practising physician	127 (11)
	Paediatrician	175 (16)
Weekly working hours	Less than 35	286 (26)
	35–44	258 (23)
	45 or more	568 (51)
Number of patients seen per week	Less than 70	441 (40)
	70–119	418 (38)
	120 or more	251 (23)
Type of practice setting	Solo practice	338 (30)
	Group practice*	729 (65)
	Other	47 (4)
Number of full-time equivalents in office	Less than 2	550 (49)
	2 to 3	384 (34)
	4 or more	176 (16)

SD: standard deviation

* At least two physicians.

Discussion

This study aimed to explore the digital health use and care coordination practices of primary care physicians in Switzerland. Our results indicate a greater use of digital health tools in physicians who had more weekly working hours, worked in group practice settings and were practising physicians. This suggests that physicians who dedicated more time to their professional activities tended to have higher utilisation of digital health. Our results also indicate that physicians in solo practices were less likely to engage in digital health compared to their colleagues in

Table 2:
Digital health score items of primary care physicians (n = 1114).

Digital health use		Score	n (%)
Proportion of consultations by video	5% or more	1	36 (3)
	Less than 5%	0	1071 (96)
Use of connected health tools to monitor the health of patients with chronic diseases	25% or more	1	185 (17)
	Less than 25%	0	229 (21)
	Never (0%)	0	699 (63)
Use of electronic patient medical records	Yes	1	928 (83)
	No	0	186 (17)
Possibility to electronically communicate patient clinical summaries	Yes	1	586 (53)
	No	0	528 (47)
Possibility to electronically communicate diagnostic and laboratory tests	Yes	1	665 (60)
	No	0	447 (40)
Possibility to electronically communicate lists of medications	Yes	1	574 (52)
	No	0	539 (48)
Practice allowing email or web communications with patients	Yes	1	986 (89)
	No	0	128 (11)
Practice allowing online appointment-taking with patients	Yes	1	177 (16)
	No	0	936 (84)
Practice allowing online medical prescription renewal	Yes	1	226 (20)
	No	0	888 (80)
Practice allowing online laboratory result acknowledgement by patients	Yes	1	204 (18)
	No	0	907 (81)
Use or plan to use the Swiss-wide “electronic patient record”	Already use it	0	28 (3)
	Plan to use it within the next 2 years	0	268 (24)
	Plan to use it within 2 years or more	0	379 (34)
	Not using it and not planning to	0	433 (39)

* Values used to build the score. We summed all variables to obtain a score ranging from 0 to 10.

Table 3:
Care coordination score items of primary care physicians (n = 1114).

Care coordination		Score*	n (%)
Presence of a nurse or case manager to help chronic disease management inside or outside the practice	Yes	1	624 (56)
	No	0	490 (44)
When your patients have been referred to a specialist, how often do you send the patient history and the reason for the consultation to the specialist?	75% or more	1	876 (79)
	25–74%	0	162 (15)
	Less than 25%	0	75 (7)
For your patients who receive home-based nursing care, how often do you communicate with home-based nursing care providers about your patients’ needs and the services to be provided?	50% or more	1	656 (59)
	25–49%	0	229 (11)
	Less than 25%	0	114 (10)
	Does not apply	0	115 (10)
For your patients who receive home-based nursing care, how often are you advised by the home-based nursing care providers of a relevant change in your patients’ condition or health status?	50% or more	1	788 (71)
	25–49%	0	123 (11)
	Less than 25%	0	86 (8)
	Does not apply	0	111 (10)
Collaboration with social services	Some collaboration	1	1043 (94)
	No collaboration	0	71 (6)

* Values used to build the score. We summed all variables to obtain a score ranging from 0 to 5.

Table 4:
Regression between digital health score and care coordination score (n = 1114), unadjusted and adjusted for age, sex, medical speciality and type of practice setting.

Variable	Beta coefficient (95% CI)	R-squared	Prob >F	p-value
Unadjusted digital health score	0.06* (0.02–0.10)	0.01	0.001	0.001
Adjusted digital health score	0.06* (0.02–0.09)	0.17	<0.001	0.001

CI: confidence interval.

* For a difference of one unit in the digital health score, a difference existed in the care coordination score of an average of 0.06 units.

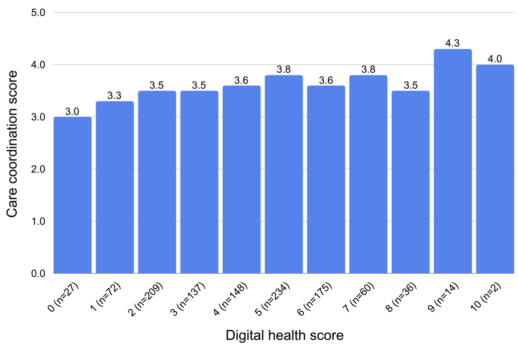
group practice settings. This disparity could be attributed to the initial costs of electronic health records, along with the technical and time-related challenges associated with the adoption of digital health, which are frequently cited as barriers to its implementation and could be more easily addressed in collaborative environments [20].

We found a modest correlation between primary care physicians' digital health score and care coordination score, suggesting that physicians who embraced digital health were overall more likely to engage in collaborative practices, such as sharing patient information with specialists and collaborating with home-based nursing care. Given other studies on the association of digital health with care coordination [21], considering that one could influence the other is becoming mainstream. However, due to the design of our study and the modest degree of association, this positive relationship could be confounded.

Many barriers exist to the adoption of digital health at both the patient and clinician levels. Our study shows a slight positive association between working hours and digital health use, where individuals with higher digital health use were also working more. A possible explanation is that physicians who work more tend to use more digital health tools to try to reduce their workload. However, the use of digital health could also add workload, which is often cited as a barrier to digital health adoption [22]. As suggested by a study published in 2021 in the Netherlands, this barrier can be addressed by adapting new technologies to the organisational structure and daily care processes and deploying the human resources required for daily care processes in line with the desired results [23]. This would reduce workload and increase adherence to digital health.

Internationally, the uptake of digital health varies by country, and Switzerland is often considered to lag behind many other countries. The International Health Policy Survey also revealed that, among the 10 OECD (Organisation for Economic Co-operation and Development) countries, Swiss physicians used the least electronic medical records and rarely transmitted patient-related documents electronically [19]. If the benefits of digital health are confirmed for patients and potentially for healthcare professionals, considering the central role of primary care physicians in patient care and engagement, policies seem necessary to enhance its implementation through better uptake among primary care physicians.

Figure 2: Mean care coordination score by eHealth score (n = 1114).



This study has some limitations. The survey was completed online and probably selected participants who were more likely to be involved in digital tools. The relatively low participation rate could have led to participation bias, and participants were probably keener to use eHealth tools. Nevertheless, the characteristics of primary care physicians are comparable between this survey and the 2022 FMH data. With a mean age of 52 versus 54 years for primary care physicians, and 46% versus 44% women, respectively [24], this similarity suggests that the survey may provide a representative portrayal of the situation in Switzerland. Additionally, self-reported information was reported in the questionnaire, suggesting a possible information bias.

A key limitation of the study is that we cannot claim that digital health use is the cause of greater care coordination. A causal relationship is possible, but it is also possible that both reflect another factor specific to the physician. Furthermore, although variables concerning medical and paramedical professionals were included, many aspects of care coordination were not fully reflected in the current score. Our study is a secondary data analysis and is strongly constrained by the data collected in this survey. Regarding the scores, we did not have another dataset to validate the score and did not perform any internal validation. We did not find a validated score that would fit our data.

The main strength of this study is its large number of participants from a random sampling of a significant share of physicians in the country. It also covers many variables characterising care coordination and the use of digital health and describes a wide range of possible uses for eHealth.

In conclusion, our findings might help better understand the use of digital health in primary care physicians in Switzerland and its association with care coordination. Recognising the factors associated with the adoption of digital health tools is essential for developing targeted strategies to overcome barriers and promote a more universally integrated and effective healthcare system.

Open science

The data and the code used to perform the analyses of this study can be shared upon request. Data are publicly available by contacting the CWF. A protocol or registration for this study was not prepared. Statistical analyses were performed using Stata 17 software (Stata Corp, TX, 2021) without using specific packages.

Acknowledgments

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Authors' contributions: *MJ*, *VS*, *ST* and *AC* wrote the protocol for the study. *MJ* analysed the data under the guidance of *ST* and drafted the manuscript with contributions by *VS*, *ST* and *AC*. All authors revised and approved the final version of the manuscript before submission.

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Potential competing interests

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflict of interest related to the content of this manuscript was disclosed.

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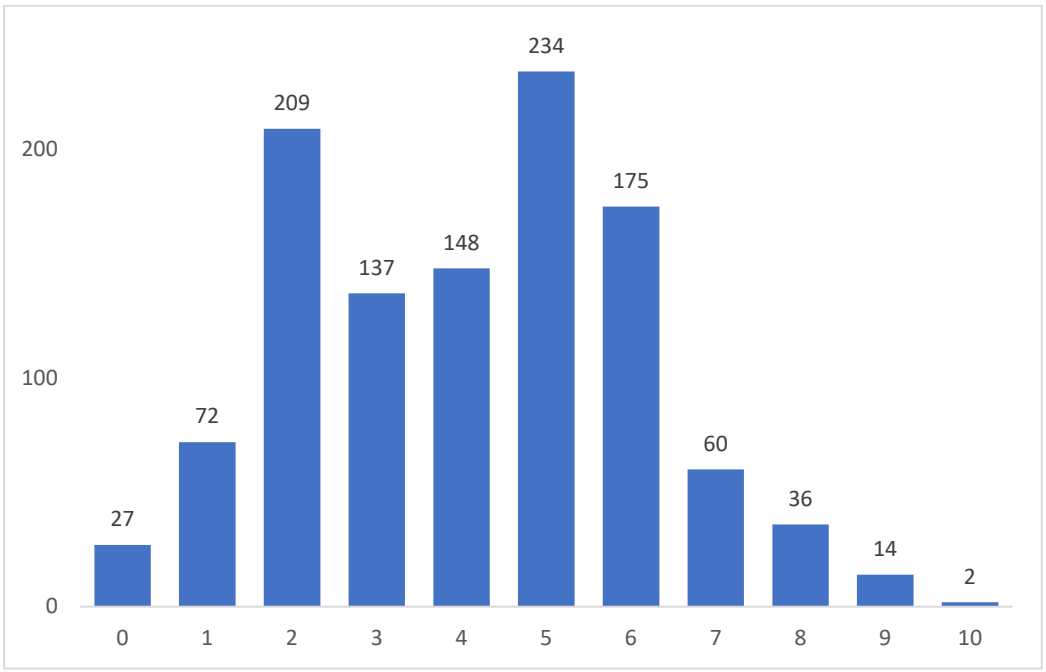
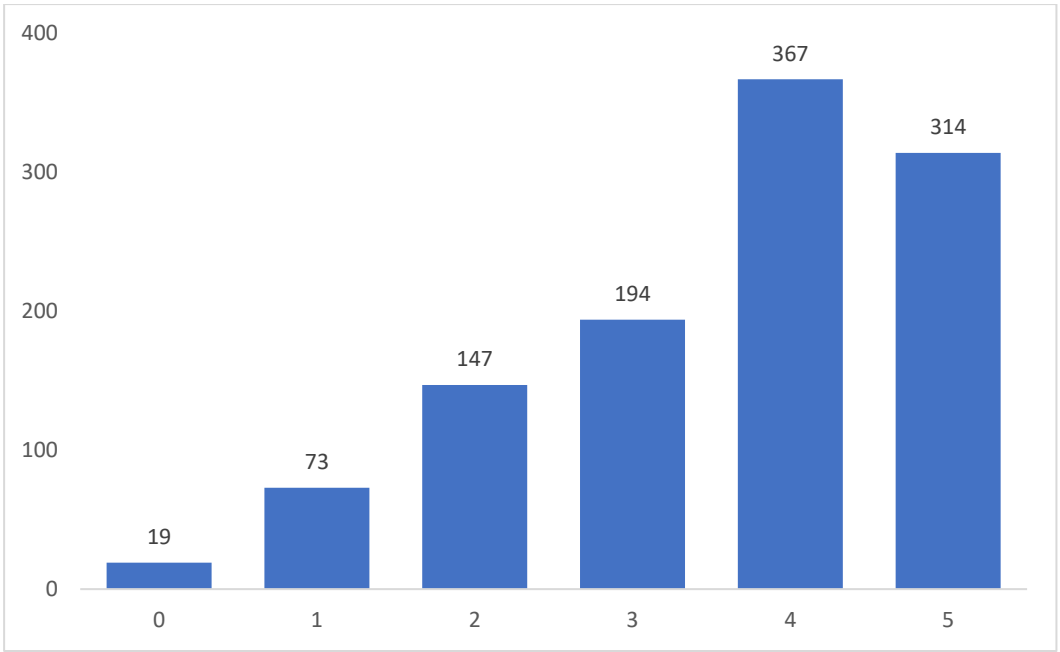
Appendix

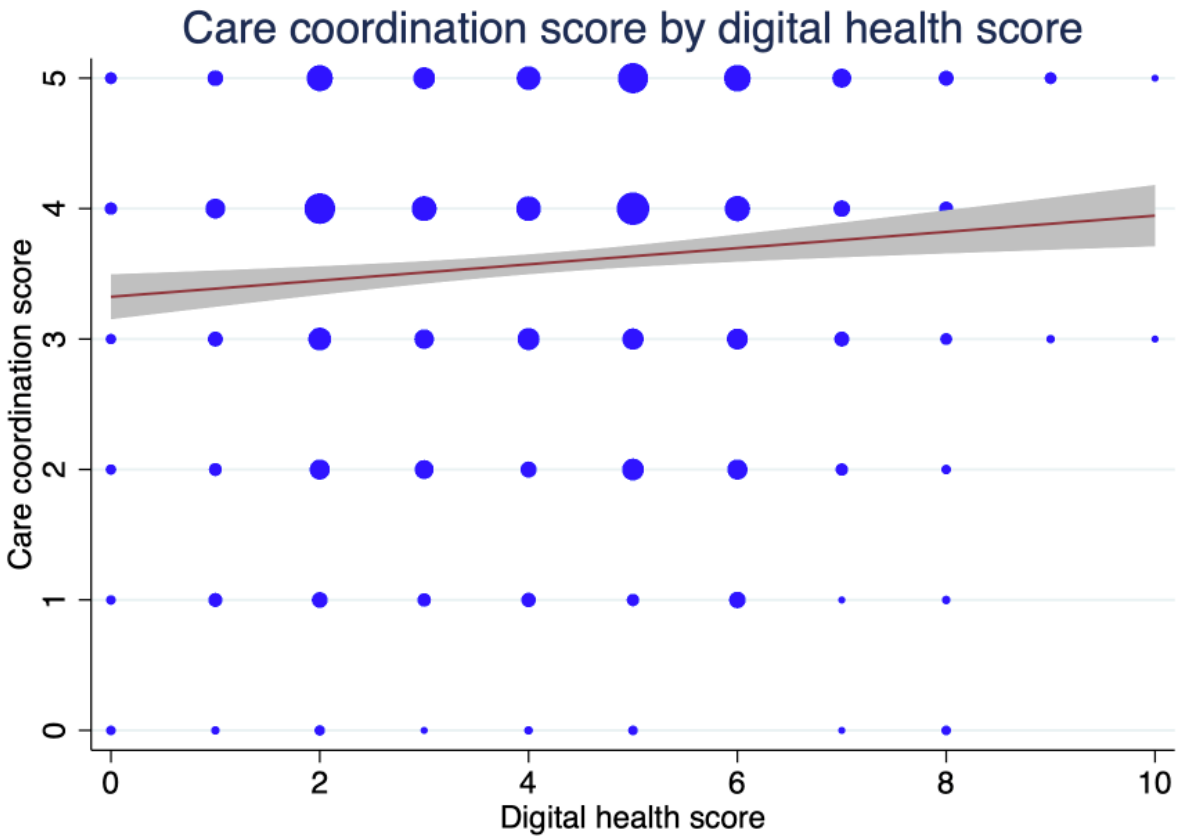
Supplementary Figure S1: Distribution of the digital health score (N = 1114).



Supplementary Figure S2: Distribution of the care coordination score (N = 1114).



Supplementary Figure S3: Scatterplot of the care coordination score by digital health score* (N = 1114).



* The size of the dots is proportional to the frequency of the outcome.

Stata Code

```
* Import data
import delimited "/Users/mathieujendly/Documents/MATLAB/Data/2022_IHP_ Final
Data_Aerzte.csv", delimiter(",")

* Filter data for participants in Switzerland (country code 9)
keep if q500 == 9

*
* PARTICIPANT CHARACTERISTICS
* Age
gen age_numeric = real(q573)
summarize age_numeric
recode age_numeric (min/39=1)(40/54=2)(55/max=3), gen(ageG)
label define age_labels 1 "less than 40 yr" 2 "40 to 54 yr" 3 "55 yr or more"
label values ageG age_labels
tabulate ageG

* Gender
gen rq574 = real(q574)
label define gender 1 "Male" 2 "Female" 3 "Other" 4 "Prefer not to answer" 999 "Declined to
answer"
label values rq574 gender
tabulate rq574, missing

* Language
gen rq570 = real(q570)
label define language 1 "German" 2 "French" 3 "Italian" 4 "Rhaeto-Romansch" 995 "Invalid" 996
"Multiple-response code" 998 "Not sure" 999 "declined to answer"
label values rq570 language
tabulate rq570, missing

* Community type
gen rq571 = real(q571)
label define community 1 "Urban" 2 "Intermediate (dense peri-urban area and rural centers)" 3
"Rural" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999 "declined to answer"
label values rq571 community
tabulate rq571, missing

* Sample file specialty
gen rq575 = real(q575)
label define specialty 1 "Internal medicine" 2 "Practising physician" 3 "Pediatrician" 995 "Invalid"
996 "Multiple-response code" 998 "Not sure" 999 "declined to answer"
label values rq575 specialty
tabulate rq575, missing

* Weekly working hours (WWH)
gen WWH = real(q41)
gen WWHint = round(WWH)
gen WWHr = WWH if WWH<=9994
gen WWHc = WWH
replace WWHc= . if WWHc <1
recode WWHc (min/34.999=1)(35/44.999=2)(45/168=3), gen(WWHg)
```

```
gen WWHo = WWHg
label define WWH_labels 1 "less than 35 hr" 2 "35 to 44 hr" 3 "45 hr or more" 9999 "declined to answer"
label values WWHg WWH_labels
tabulate WWHg, missing

* Patients per week (PPW)
gen PPWc = q42
recode PPWc (min/69.999=1)(70/119.999=2)(120/9000=3), gen(PPWg)
gen PPWo = PPWg
label define PPW_labels 1 "less than 70" 2 "70 to 119" 3 "120 or more" 9999 "declined to answer"
label values PPWg PPW_labels
tabulate PPWg, missing

* Full-time equivalent (FTE) doctors
gen FTE = real(q40)
gen FTEint = round(FTE)
*We placed an arbitrary upper limit of 100 physicians per practice, considering that all physicians answering a number above 100 probably mistook the values for percentages. Therefore, the line of code just below reflects that modification.
replace FTE= FTE / 100 if FTE >= 100 & FTE <= 994
gen FTEr = FTE if FTE<=994
gen FTEc = FTE
recode FTEc (min/1.999=1)(2/3.999=2)(4/994=3), gen(FTEg)
gen FTEo=FTEg
label define FTE_labels 1 "less than 2 FTE" 2 "2 to 3 FTE" 3 "4 FTE or more"  995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999 "declined to answer"
label values FTEg FTE_labels
tab FTEg, missing

* Type of practice setting
gen rswi6 = real(swi6)
gen setting = .
replace setting = 1 if rswi6 == 1
replace setting = 2 if rswi6 == 2
replace setting = 3 if rswi6 == 3  |  rswi6 == 3  |  rswi6 == 4  |  rswi6 == 7 |  rswi6 == 998 |  rswi6 == 999
label define cs 1 "Private (solo) practice" 2 "Physician group practice" 3 "Other" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999 "declined to answer"
label values setting cs
tabulate setting, missing

* _____

* EHEALTH PROFILE

* % consultations by video
gen VID = real(q8_3)
gen VIDc = VID
recode VIDc (min/4.999=1)(5/599.999=2), gen(VIDg)
gen VIDo = VIDg
label define VID_labels 1 "less than 5%" 2 "5% or more"
label values VIDg VID_labels
tabulate VIDg, missing
```

```
* Use of connected health tools to monitor the health of patients with chronic diseases
gen CHT=.
replace CHT=1 if q15_5==1 | q15_5== 2 | q15_5== 3
replace CHT=2 if q15_5==4
replace CHT=3 if q15_5==5
gen CHTo=CHT
label define tools 1 "25% or more" 2 "1-24%" 3 "Never"
label values CHT tools
tabulate CHT, missing

* Do you use EHRs in your practice
gen EHRo = q23
label define EHR 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999
"declined to answer"
label values q23 EHR
tabulate q23, missing

* possibility of...

* communication clinical summaries
gen csumo = q24_1
label define csum 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999
"declined to answer"
label values q24_1 csum
tabulate q24_1, missing

* possibility communication lab tests
gen clabo = q24_2
label define clab 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999
"declined to answer"
label values q24_2 clab
tabulate q24_2, missing

* possibility communication drug lists
gen cdrugo = q24_3
label define cdrug 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999
"declined to answer"
label values q24_3 cdrug
tabulate q24_3, missing

* Practice allowing e-mail or web communications with patients
gen mailwebo = q25_1
label define mailweb 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure"
999 "declined to answer"
label values q25_1 mailweb
tabulate q25_1, missing

* Practice allowing web scheduling
gen webschedo = q25_2
label define websched 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure"
999 "declined to answer"
label values q25_2 websched
tabulate q25_2, missing
```

```
* Practice allowing online prescriptions / renewals
gen presco = q25_3
label define presc 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999
"declined to answer"
label values q25_3 presc
tabulate q25_3, missing

* Practice allowing online lab results
gen olabo = q25_4
label define olab 1 "Yes" 2 "No" 995 "Invalid" 996 "Multiple-response code" 998 "Not sure" 999
"declined to answer"
label values q25_4 olab
tabulate q25_4, missing

* Adhesion to the national "Electronic Patient Record"
gen rswi2 = real(swi2)
gen DEPc = .
replace DEPc = 1 if rswi2 == 6
replace DEPc = 2 if rswi2 == 1  |  rswi2 == 2
replace DEPc = 3 if rswi2 == 3  |  rswi2 == 4
replace DEPc = 4 if rswi2 == 5
replace DEPc = 995 if rswi2 == 995
replace DEPc = 996 if rswi2 == 996
replace DEPc = 998 if rswi2 == 998
replace DEPc = 999 if rswi2 == 999
*label define DEP 1 "Yes, within this year" 2 "Yes, within the next one to two years" 3 "Yes,
within the next two to three years" 4 "Yes, but will take three or more years" 5 "No, I'm not
planning to join the national Electronic Patient Record" 6 "I already use the Swiss-wide
electronic patient dossier ans am part of a regular community" 995 "Invalid" 996 "Multiple-
response code" 998 "Not sure" 999 "declined to answer"
label define DEP 1 "I already use the Swiss-wide electronic patient dossier ans am part of a
regular community" 2 "Yes, within the next two years" 3 "Yes, but will take two or more years" 4
"No, I'm not planning to join the national Electronic Patient Record" 995 "Invalid" 996 "Multiple-
response code" 998 "Not sure" 999 "declined to answer"
label values DEPc DEP
tabulate DEPc, missing

*
```

```
* CARE COORDINATION

* No use of nurses or case managers for chronic diseases management
* 0 means collaboration, 1 means no collaboration
gen oq14_3 = q14_3
gen q14=0
replace q14=1 if q14_1==1  |  q14_2==1
label define nursecdm 0 "No collaboration" 1 "Collaboration"
label define nursecdm1 0 "Collaboration" 1 "No collaboration"
label values q14 nursecdm
label values q14_3 nursecdm1
tabulate q14, missing
tabulate q14_3, missing

* Communication of patient history to specialist
gen comspec=.
```

```
replace comspec=1 if q17_1==1
replace comspec=2 if q17_1==2 | q17_1==3
replace comspec=3 if q17_1==4 | q17_1==5
gen ocomspec = comspec
label define comhist 1 "75% or more" 2 "25-74%" 3 "Less than 25%"
label values comspec comhist
tabulate comspec, missing

* Communication with home-based nursing about needs
gen comn=.
replace comn=1 if q20_1==1 |  q20_1==2
replace comn=2 if q20_1==3
replace comn=3 if q20_1==4 | q20_1==5
replace comn=4 if q20_1==6
gen ocomn = comn
label define comneeds 1 "50% or more" 2 "25-49%" 3 "Less than 25%" 4 "Does not apply"
label values comn comneeds
tabulate comn, missing

* Communication with home-based nursing about health status
gen comhs=.
replace comhs=1 if q20_2==1 | q20_2==2
replace comhs=2 if q20_2==3
replace comhs=3 if q20_2==4 | q20_2==5
replace comhs=4 if q20_2==6
gen ocomhs = comhs
label define comstatus 1 "50% or more" 2 "25-49%" 3 "Less than 25%" 4 "Does not apply"
label values comhs comstatus
tabulate comhs, missing

* No collaboration at all with social services (the collaboration with social services was
evaluated through multiple variables, and we summarized it in a binary variable by displaying all
physicians that answered “no” to all collaboration with social services variables).
gen q22NO = 0
replace q22NO = 1 if q22_1 == 4 & q22_2 == 4 & q22_3 == 4 & q22_4 == 4 & q22_5 == 4
gen oq22NO = q22NO
label define nocom 0 "Some collaboration" 1 "No collaboration at all"
label values q22NO nocom
tabulate q22NO, missing

*
```



```
* Build eHealth score
gen EHS = 0
replace EHS = EHS + (VIDo == 2) + (CHTo == 1) + (EHRo==1) + (csumo == 1) + (clabo == 1) +
(cdrugo == 1) + (mailwebo == 1)+ (webschedo == 1)+ (presco == 1) + (olabo == 1)

*
```



```
* Care coordination score
gen CCS = 0
replace CCS = CCS + (oq14_3 == 0) + (ocomspec == 1) + (ocomn == 1) + (ocomhs == 1) +
(q22NO == 0)
```

```
*
* Stratified analyses

* Scores by characteristics
bysort ageG: ci means EHS
bysort ageG: ci means CCS
bysort rq574: ci means EHS
bysort rq574: ci means CCS
bysort rq570: ci means EHS
bysort rq570: ci means CCS
bysort rq571: ci means EHS
bysort rq571: ci means CCS
bysort rq575: ci means EHS
bysort rq575: ci means CCS
bysort WWHg: ci means EHS
bysort WWHg: ci means CCS
bysort PPWg: ci means EHS
bysort PPWg: ci means CCS
bysort setting: ci means EHS
bysort setting: ci means CCS
bysort FTEg: ci means EHS
bysort FTEg: ci means CCS

* CCS by EHS
bysort EHS: ci means CCS


*Tabulate and show graph
tab EHS CCS, row

*
*Regression CCS EHS
regress CCS EHS
*regress CCS EHS c.age_numeric c.rq574 c.rq575 c.setting

* Assumptions of the linear regression :
* 1. Linearity with scatterplot
bysort EHS CCS: gen freq = _N
twoway (scatter CCS EHS [fweight=freq], msize(*0.2) msymbol(circle) mcolor(blue)) (lfitci CCS
EHS), ytitle(`"Care coordination score"') xtitle(`"Digital health score"') title(`"Care coordination
score by digital health score"') legend(off) graphregion(color(white))
* 2. Homoscedasticity with Breusch-Pagan test
estat hettest
* then perform collinearity check for corrected regression
regress CCS EHS c.age_numeric c.rq574 c.rq575 c.setting
estat vif
* 3. Independence: by study design
* 4. Normality
swilk res
```