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## TELEMEDICINE IN HIV CARE IN TIMES OF COVID-19 PANDEMIC: A PATIENT SATISFACTION SURVEY STUDY

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### ABSTRACT

**BACKGROUND.** Until SARS-CoV-2 outbreak telemedicine services in HIV care in Poland were not covered by public health insurance. Therefore experience in this form of healthcare delivery is scarce and its acceptance by patients uncertain.

**OBJECTIVES.** We aimed to investigate the opinion of people living with HIV on the first application of telemedicine in HIV care in Poland.

**METHODS.** The survey consisted of the qualitative module (carried out through online interviews using the Computer-Assisted Web Interview technique) and the quantitative module (20 questions, including five open-type questions and 15 closed-type questions). Four nongovernmental organizations supporting people living with HIV in Poland, participated in the distribution of invitations.

**RESULTS.** In total, 156 respondents provided answers, 25% were women, 58% over 50 years old, 53% were heterosexual. Most respondents were tested for HIV in public healthcare facility (51%) or voluntary testing (32%) and diagnosed over 5 years ago. 77/156 (49.3%) respondents had opinion about telemedicine, of those 22/77 (28.6%) respondents answered that they thought that telemedicine had a future and 29/77 (37.7%) that it did, but under certain conditions (this constitutes 66.2% of those with opinion). 26/77 (33.8%) respondents indicated that in their opinion telemedicine had no future. Respondents who had negative opinion were more likely to be from rural areas and of lower level of education. In logistic regression models we found that having a primary education increased the odds of not having an opinion by over five folds (OR=5.37 [2.44 to 11.82],  $P < .0001$ ). Factors decreasing the odds of not having an opinion were difficulties in getting a visit (0.35 [0.15 to 0.81],  $P = .01$ ) and access to telemedicine only (0.20 [0.06 to 0.72],  $P = .01$ ).

**CONCLUSIONS.** Although over 60% of respondents with opinion identified potential for telemedicine in HIV care, half of them indicated specific conditions necessary to introduce it. The evaluation of timely and effective disease management via telemedicine, as well as patients' and providers' acceptance to this form of care needs to be supervised and adequately corrected to patients' reported experience measures.

**Keywords:** *antiretroviral therapy, telemedicine, survey*

### STRESZCZENIE

**WPROWADZENIE.** Do czasu wybuchu epidemii SARS-CoV-2 usługi telemedyczne w zakresie opieki nad osobami żyjącymi z HIV w Polsce nie były objęte powszechnym ubezpieczeniem zdrowotnym. Dlatego doświadczenie w tej formie świadczenia opieki zdrowotnej jest niewielkie i wymagają oceny akceptacji przez pacjentów.

**CEL.** Naszym celem było poznanie opinii osób żyjących z HIV na temat pierwszego powszechnego zastosowania telemedycyny w opiece nad osobami z HIV w Polsce.

**MATERIAŁ I METODY.** W badaniu stosowano ankiety składające się z modułu jakościowego (przeprowadzonego za pomocą wywiadów online przy użyciu techniki Computer-Assisted Web Interview) i modułu ilościowego (20 pytań, w tym pięć pytań otwartych i 15 pytań zamkniętych). W dystrybucji zaproszeń uczestniczyły cztery organizacje pozarządowe wspierające osoby żyjące z HIV w Polsce.

**WYNIKI.** 156 respondentów udzieliło odpowiedzi, 25% kobiet, 58% miało ponad 50 lat, 53% było heteroseksualnych. Większość respondentów została zdiagnozowana w publicznej placówce medycznej (51%) lub anonimowo (32%). 77/156 (49,3%) respondentów miało opinię na temat telemedycyny, z czego 22/77 (28,6%) odpowiedziało, że ich zdaniem telemedycyna ma przyszłość, a 29/77 (19%), że tak, ale pod pewnymi warunkami (stanowi to 66,2% osób mających opinię). 26/77 (33,8%) respondentów wskazało, że ich zdaniem telemedycyna nie ma przyszłości. Respondenci, którzy mieli negatywną opinię, częściej pochodzili z terenów wiejskich i mieli niższy poziom wykształcenia. W modelach regresji logistycznej posiadanie wykształcenia podstawowego zwiększało prawdopodobieństwo braku opinii ponad pięciokrotnie ( $OR = 5,37 [2,44 \text{ do } 11,82], P < 0,0001$ ). Czynniki zmniejszające prawdopodobieństwo braku opinii były trudności w uzyskaniu wizyty ( $0,35 [0,15 \text{ do } 0,81], P = 0,01$ ) i dostęp wyłącznie do telemedycyny ( $0,20 [0,06 \text{ do } 0,72], P = 0,01$ ).

**WNIOSKI.** Chociaż ponad 60% respondentów mających opinię wskazało potencjał telemedycyny w opiece nad osobami z HIV, połowa z nich wskazała konkretne warunki konieczne do jej wprowadzenia. Ocena leczenia HIV za pośrednictwem telemedycyny, a także akceptacja tej formy opieki przez pacjentów i dostawców musi być nadzorowana i korygowana w odniesieniu do zgłaszanych przez pacjentów miar wyników.

**Słowa kluczowe:** *HIV, badanie, telemedycyna, terapia antyretrowirusowa*

## INTRODUCTION

Telemedicine, or otherwise called telehealth, is defined as the delivery of health care via remote technologies (1). Live video conferencing, mobile health apps, electronic transmission, and remote patient monitoring systems are examples of technologies used in telehealth. This should include patient education, as well as both self-care and self-assessment via digital communication technologies.

In 2017 Infectious Diseases Society of America issued a Position Statement on Telehealth and Telemedicine as Applied to the Practice of Infectious Diseases advising its wider use (2). Moreover in the updated guidance from 2021 the World Health Organization (WHO) is supporting the wide use of telehealth tools across all stages of HIV care (3).

Unfortunately, before the outbreak of Coronavirus 2019 disease (COVID-19) the use of telehealth was limited to narrow indications and rarely applied in the field of infectious diseases (4-6). In addition, in many Central European countries, including Poland, only few areas of telehealth were covered by public health insurance. Therefore experience in this form of healthcare delivery is scarce and its acceptance by patients uncertain.

COVID-19 pandemic has successfully boosted the use of telemedicine across both already implemented and new areas of medical services (6). Healthcare provides rapidly transitioned from in-person to tele- or video consultations, using it on unseen scale (7). Along with this utilization some important concerns were raised, namely uncertainty about patient-provider

relationship, the quality of care and access to effective implementation tools (8).

In mid-2020, due to significant healthcare overload and in the need to maximize resources, the use of telemedicine started to be popularized (9,10). National Health Fund in Poland allowed for the reimbursement of medical care delivered via tele and video visits. These tools were therefore applied in HIV clinics. Its effectiveness is of particular concern in the area of HIV care, where continuous delivery of antiretroviral therapy is necessary not only to ascertain patients wellbeing, but to reduce the risk of ongoing HIV transmission. Moreover patient satisfaction factor has not been studied in depth for telemedicine use even in already existing applications, not mentioning the new areas of its implementation (11).

Here we present the results of the survey investigating the opinion of HIV positive patients on the first application of telemedicine in HIV care in Poland.

## METHODS

**Survey.** This is a mix method study based on a quantitative and qualitative survey. The survey consisted of two modules: the qualitative and the quantitative module. The qualitative module was carried out through online interviews using the Computer-Assisted Web Interview (CAWI) technique. As part of the quantitative research, a questionnaire containing 20 questions was used, including five open-type questions and 15 closed-type questions. Four nongovernmental and non-profit organizations, which support people living with HIV in Poland, participated

in the distribution of invitations. The involvement of these organisations was to ensure that and to reach people who were afraid of stigmatization and social exclusion related to disclosing HIV status.

After the quantitative part and initial verification of the obtained indicators, a qualitative module was carried out. As part of the qualitative module, nine individual in-depth interviews (IDI) were carried out online using the MS Teams platform. The results of this module are not the subject of this paper and therefore will not be presented.

In total, 169 questionnaires were received and nine qualitative interviews were conducted. Not all respondents provided complete answers to the identification questions.

**Statistical analyses.** We summarized the results of the survey using descriptive statistics. The analysis was conducted in two variants. In variant one, the full distribution of responses to this question was analysed. The statistical significance of differences was assessed with the test  $\chi^2$ . In variant two, a subgroup analysis was performed after binary categorisation based on responses to the question ‘Do you think telemedicine has a future in HIV therapy?’: responses of ‘yes’, ‘rather yes’ and ‘no’ were considered as clarified opinion in contrary to lack of it. In addition we performed logistic regression analyses to identify factors associated with lack of opinion. All factors were tested in univariate analyses and those significant with  $P < .1$  were included into the multivariate model.

**Ethical considerations.** This is a questionnaire internet base study with anonymous participation and therefore we did not request a formal ethical review, however we conducted the survey in accordance human subject research ethics. In terms of confidentiality participants were not requested to provide any personal data allowing for their identification and they were given full information and opportunity to accept or reject the invitation to survey. Invitations were distributed by non-governmental organizations. Responses received unique identifiers and at any stage of this project it was not possible to deidentify individual persons.

## RESULTS

In total 156 respondents provided answer to the question about the future of telemedicine in HIV care. Their detailed baseline characteristics are presented in Table 1. In general 25% of patients were female, majority (58%) was over 50 years old, most participants had secondary (49%) or tertiary (35%) education and lived in cities with over 100 thousand of citizens (64%). Fifty three percent were heterosexual, 36% were homosexual, 6% were bisexual, 1% were

transsexual; 1% identified as other gender than listed above and 5% not specified their gender. Most respondents were first tested positive for HIV in public healthcare facility (51%) or Voluntary Testing Centre (32%) and diagnosed over 5 years ago. Eighteen percent of participants was diagnosed less than 5 years before and the vast majority of this group, i.e. 90%, reported to an infectious disease clinic within one month of receiving a positive HIV test result, and 73% started ARV therapy no later than one month after the first medical visit (data not shown in Table 1). In general, when asked if they would start antiretroviral therapy within 7 days from diagnosis the majority (61%) agreed.

### *Subgroup analysis by full distribution of responses to the question on the future of telemedicine.*

Seventy seven (49.3%) respondents had opinion about telemedicine and 79 (51%) had no opinion. Of those with opinion 22 (28.6%) respondents answered that they thought that telemedicine had a future and 29 (37.7%) that it did, but under certain conditions (this constitutes 66.2% of those with opinion). Twenty six (33.8%) respondents indicated that in their opinion telemedicine had no future. The distribution of baseline characteristics across responses is presented in Table 1.

In an analysis of the full distribution of responses to the question about the future of telemedicine, gender was found to be significant ( $P=0.004$ ). Women were more likely to answer “yes” as compared to man (12/22, 54% vs. 10/22, 45%; respectively) and reversely men were more likely as compared to women to answer “no” to this question (17/26, 65% vs. 9/26, 35%; respectively).

The size of the population of the place of residence was also significant ( $P = .008$ ). Among those who answered positively towards a future for telemedicine 76% were residents of towns with 100 thousand inhabitants and only 10% reside in villages. Whereas among those who answered “no” this distribution was not as profound with 38% coming from big towns vs. 31% from villages. Exploring the particular subgroups revealed that among those coming from towns <500,000, 21% (18/87) thought telemedicine had a future and 79% (69/87) thought they did not or had no opinion ( $P < .0005$ ). Most opponents of telemedicine lived in rural areas; among rural residents, 47% (8/17) saw no future for telemedicine, and among urban residents, 18/117 (15%) ( $P < .001$ ).

Education was also significant in this variant of analysis ( $P=0.002$ ). In general of those who said “yes” to the future of telemedicine all were with secondary or tertiary education. Among those with tertiary education, a higher proportion believed that telemedicine had a future in HIV treatment than that

Table 1. Baseline characteristics for all respondents and stratified by answer (*Q: 'Do you think telemedicine has a future in HIV therapy?'*)

Variable N ( % )		All	Yes	Rather yes	No	It's hard to say	P value
Total		156 (100)	22 (14)	29 (19)	26 (17)	79 (51)	-
Gender	Females	39 (25)	12 (55)	2 (7)	9 (35)	16 (20)	0.004
	Males	115 (74)	10 (45)	27 (93)	17 (65)	61 (77)	
	Other	2 (1)	0 (0)	0 (0)	0 (0)	2 (3)	
Age	25-34	21 (14)	4 (19)	7 (25)	2 (8)	8 (10)	0.09
	35-39	16 (10)	6 (29)	2 (7)	1 (4)	7 (9)	
	45-49	26 (17)	2 (10)	6 (21)	7 (27)	11 (14)	
	50-59	39 (25)	4 (19)	7 (25)	6 (23)	22 (28)	
	≥60	51 (33)	5 (24)	6 (21)	10 (38)	30 (38)	
Education	Primary	17 (12)	0 (0)	1 (4)	6 (23)	10 (13)	0.002
	Secondary	75 (49)	8 (38)	8 (29)	11 (42)	48 (62)	
	Higher	53 (35)	13 (62)	17 (61)	8 (31)	15 (19)	
	Refusal to answer	7 (5)	0 (0)	2 (7)	1 (4)	4 (5)	
Place of residence	Village	17 (11)	2 (10)	1 (4)	8 (31)	6 (8)	0.008
	<20 K	13 (9)	1 (5)	0 (0)	3 (12)	9 (12)	
	21-50 K	13 (9)	1 (5)	2 (7)	1 (4)	9 (12)	
	51-100 K	12 (8)	1 (5)	0 (0)	4 (15)	7 (9)	
	100-500 K	32 (21)	5 (24)	5 (18)	4 (15)	18 (23)	
	>500 K	65 (43)	11 (52)	20 (71)	6 (23)	28 (36)	
Sexual orientation	Heterosexual	80 (53)	12 (57)	8 (29)	15 (58)	45 (58)	0.07
	Homosexual	54 (36)	7 (33)	17 (61)	6 (23)	24 (31)	
	Bisexual	9 (6)	2 (10)	1 (4)	3 (12)	3 (4)	
	Transsexual	1 (1)	0 (0)	1 (0)	0 (0)	0 (0)	
	Other	1 (1)	0 (0)	0 (0)	1 (4)	0 (0)	
	Not specified	7 (5)	0 (0)	1 (4)	1 (4)	5 (6)	
Time from diagnosis	< 5 years	28 (18)	8 (26)	5 (17)	5 (19)	10 (13)	0.20
	5-10 years	28 (18)	4 (18)	4 (14)	4 (15)	16 (20)	
	10-15 years	21 (13)	3 (14)	5 (17)	1 (4)	12 (15)	
	15-20 years	24 (15)	0 (0)	7 (24)	3 (12)	14 (18)	
	>20 years	55 (35)	7 (32)	8 (28)	13 (50)	27 (34)	
Place of the first positive HIV test	Public healthcare	80 (51)	9 (41)	15 (52)	11 (42)	45 (57)	0.47
	Private laboratory	13 (8)	2 (9)	2 (7)	2 (8)	7 (9)	
	Voluntary testing	50 (32)	10 (45)	10 (34)	11 (42)	19 (24)	
	Other	13 (8)	1 (5)	2 (7)	2 (8)	8 (10)	
Starting treatment within 7 days	Definitely yes	12 (8)	2 (9)	3 (10)	2 (8)	5 (6)	0.69
	Rather yes	9 (6)	1 (5)	1 (3)	3 (12)	4 (5)	
	Neither yes nor no	4 (3)	1 (5)	1 (3)	1 (4)	1 (1)	
	Rather yes	20 (13)	4 (18)	2 (7)	2 (8)	12 (15)	
	Definitely yes	77 (49)	10 (45)	18 (62)	15 (58)	34 (43)	
	Don't know/hard to say	34 (22)	4 (18)	4 (14)	3 (12)	23 (29)	

it did not (57% (30/53) vs. 43% (23/53)), while among those with at most secondary education the proportion was 19% (19/99) vs. 81% (80/99) ( $P < 0.005$ ). The differences were even greater when those with tertiary or secondary education were contrasted with those with primary education or those refusing to answer. In the group with at least secondary education, 36%

(46/128) saw a future for telemedicine and 64% (82/128) either did not see it or had no opinion; in the group with primary education or refusal to answer, these percentages were 12% (3/24) and 87% (21/24), respectively ( $P < 0.05$ ).

Not significantly different was the distribution of replies in respect to: age, sexual orientation, time since

diagnosis, location of first HIV test, willingness to start ARV treatment within 7 days of diagnosis, access to telemedicine only and difficulty in getting a visit.

Figure 1 presents the distribution of responses to the question about the future of telemedicine according to the level of satisfaction with outpatient clinic services

during the pandemic. The smallest number of people who do not see the use of telemedicine in the future was among those who were neither satisfied nor dissatisfied with medical care during this period. The number of sceptics (answer: “no”) increased with both increased satisfaction and increased dissatisfaction.

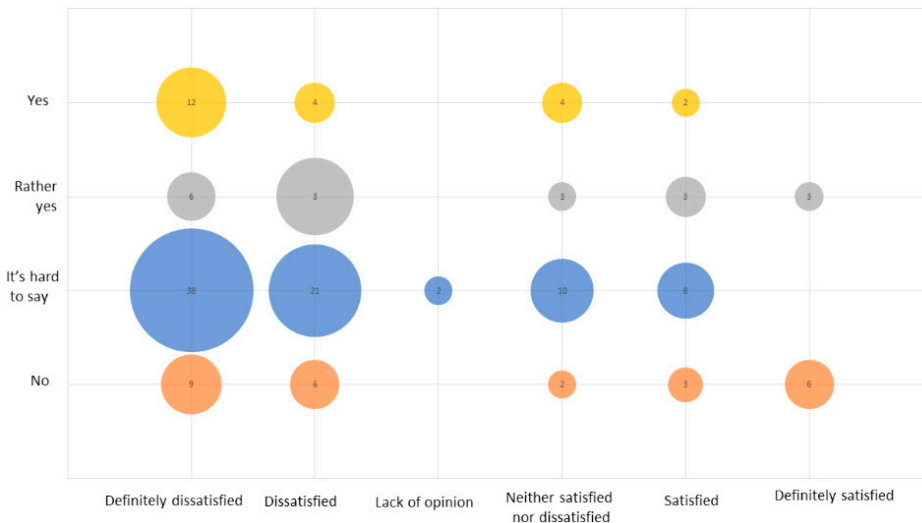


Figure 1. Distribution of responses to the question about the future of telemedicine according to the level of satisfaction with dispensary services during the pandemic. The bubble size represent % of all

Table 2. Respondents' postulates on how to improve the quality of HIV services during the COVID pandemic

Postulate N, % of all patients	All	Without opinion	With clarified opinion	Yes	Rather yes	No	Its's hard to say
None	89 (59)	55 (36)	34 (22)	9 (6)	12 (8)	13(9)	55 (36)
More frequent diagnostic tests	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Better atmosphere	1 (1)	0 (0)	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)
COVID-free clinic	1 (1)	0 (0)	1 (1)	0 (0)	0 (0)	1 (1)	0 (0)
More frequent consultations	10 (7)	3 (2)	7 (5)	1 (1)	3 (2)	3 (2)	3 (2)
Optional telephone consultation	2 (1)	0 (0)	2 (1)	2 (1)	0 (0)	0 (0)	0 (0)
Better patient education/ communication	3 (2)	2 (1)	1 (1)	0 (0)	0 (0)	1 (1)	2 (1)
Wider range of specialists	5 (3)	3 (2)	2 (1)	0 (0)	2 (1)	0 (0)	3 (2)
Less frequent visits	6 (4)	2 (1)	4 (3)	2 (1)	1 (1)	1 (1)	2 (1)
Face-to-face visits only	3 (2)	0 (0)	3 (2)	0(0)	0(0)	3 (2)	0(0)
More discretion in dispensing medicines	1 (1)	0 (0)	1 (1)	0 (0)	0 (0)	3 (2)	0 (0)
Wider range of visit hours	5 (3)	2 (1)	3 (2)	1 (1)	1 (1)	1 (1)	2 (1)
Online appointment scheduling	1 (1)	0 (0)	1 (1)	0 (0)	1 (1)	0 (0)	0 (0)
Choice of staff	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Answering phones faster	5 (3)	2 (1)	3 (2)	1 (1)	1 (1)	1 (1)	2 (1)
More doctors	6 (4)	2 (1)	4 (3)	1 (1)	2 (1)	1 (1)	2 (1)
Easier access to medical records	2 (1)	0 (0)	2 (1)	1 (1)	1 (1)	0 (0)	0 (0)
Drugs delivered by a pharmacy	1 (1)	0 (0)	1 (1)	0 (0)	1 (1)	0 (0)	0 (0)
Booking an appointment time	3 (2)	2 (1)	1 (1)	0 (0)	0 (0)	1 (1)	2 (1)
More involved/educated doctors	3 (2)	1 (1)	2 (1)	1 (1)	1 (1)	0 (0)	1 (1)
e-services	3 (2)	1 (1)	2 (1)	1 (1)	1 (1)	0 (0)	1 (1)



Table 3. Baseline characteristics stratified by having and not having an opinion on the future of telemedicine in HIV care

Variable N (%)		All	With clarified opinion	Without opinion	P value
Total		156 (100)	77 (100)	79 (100)	-
Gender (n=156)	Females	39 (25)	23 (30)	16 (20)	0.16
	Males	115 (74)	54 (70)	61 (77)	
	Other	2 (1)	0 (0)	2 (3)	
Age (n=153)	25-34	21 (14)	8 (10)	13 (10)	0.38
	35-39	16 (10)	7 (9)	9 (9)	
	45-49	26 (17)	11 (14)	15 (14)	
	50-59	39 (25)	22 (28)	17 (28)	
	≥60	51 (33)	30 (38)	21 (38)	
	<50	63	26 (33)	37 (49)	0.04
	≥50	90 (58)	52 (67)	38 (51)	
Education (n=152)	Primary - not completed	1 (1)	0 (0)	1 (1)	0.02
	Primary	16 (11)	7 (9)	9 (12)	
	Secondary	75 (49)	27 (36)	48 (62)	
	Tertiary	53 (35)	38 (51)	15 (19)	
	Refusal to answer	7 (5)	3 (4)	4 (5)	
Place of residence (n=152)	Village	17 (11)	11 (15)	6 (8)	0.19
	<20 K	13 (9)	4 (5)	9 (12)	
	21-50 K	13 (9)	4 (5)	9 (12)	
	51-100 K	12 (8)	5 (7)	7 (9)	
	100-500 K	32 (21)	14 (19)	18 (23)	
	>500 K	65 (43)	37 (49)	28 (36)	
Sexual orientation (n=152)	Heterosexual	80 (53)	35 (47)	45 (58)	0.29
	Homosexual	54 (36)	30 (40)	24 (31)	
	Bisexual	9 (6)	6 (8)	3 (4)	
	Transsexual	1 (1)	1 (1)	0 (0)	
	Other	1 (1)	1 (1)	0 (0)	
	Not specified	7 (5)	2 (3)	5 (6)	
Time from diagnosis (n=156)	< 5 years	28 (18)	18 (23)	10 (13)	0.41
	5-10 years	28 (18)	12 (16)	16 (20)	
	10-15 years	21 (13)	9 (12)	12 (15)	
	15-20 years	24 (15)	10 (13)	14 (18)	
	>20 years	55 (35)	28 (36)	27 (34)	
Place of the first test (n=156)	Public healthcare facility	80 (51)	35 (45)	45 (57)	0.18
	Private laboratory	13 (8)	6 (8)	7 (9)	
	Voluntary testing point	50 (32)	31 (40)	19 (24)	
	Other	13 (8)	5 (6)	8 (10)	
Treatment within 7 days (n=156)	Definitely yes	12 (8)	7 (9)	5 (6)	0.18
	Rather yes	9 (6)	5 (6)	4 (5)	
	Neither yes nor no	4 (3)	3 (4)	1 (1)	
	Rather yes	20 (13)	8 (10)	12 (15)	
	Definitely yes	77 (49)	43 (56)	34 (43)	
	Don't know/hard to say	34 (22)	11 (14)	23 (29)	

The number of those with no opinion increased with an increase in dissatisfaction. The number of strong supporters increased with increasing dissatisfaction. The differences in overall distribution were statistically significant ( $P<.005$ ).

Twenty respondents (13% of the total participants) justified their position: 13 (65%) said that personal visits were unnecessary, 6 (30%) said they were an inconvenience and one answer (5%) was unclear. Twenty-five people (16% of those who participated in

Table 4. Unadjusted and adjusted odds ratios for not having an opinion on telemedicine in HIV care

		Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Education	Primary/ secondary Tertiary	4.47 (2.13-9.40) 1.00	.0001	5.37 (2.44-11.82)	<0.0001
Access to telemedicine only*	Yes No	0.30(0.09- 0.98) 1.00	.04	0.20 (0.06-0.72)	0.01
Difficulties in getting a face-to-face visit*	Yes No	0.50 (0.24- 1.06) 1.00	.07	0.35 (0.15-0.81)	0.01
Gender	Male Female	1.00 1.62 (0.77 to 3.41)	.19	-	-
Age in years	25-34	1.00	.58	-	-
	35-39	0.74 (0.26 to .13)	.37		
	45-49	0.68 (0.29 to 1.60)	.60		
	50-59	1.22 (0.58 to 2.58)	.14		
	≥ 60	1.68 (0.84 to 3.34)			
Residence	village	0.51 (0.18 to 1.46)	.21	-	-
	<20 000	2.42 (0.70 to 8.32)	.16		
	21-50 000	2.12 (0.60 to 7.44)	.29		
	50-100 000	1.44 (0.43 to 4.81)	.55		
	100-500 000	1.38 (0.62 to 3.04)	.43		
	> 500 000	1.00			
Sexual orientation	Homo/bisexual Heterosexual	0.62 (0.32-1.18) 1.00	.14	-	-

\* due to COVID-19 pandemic restrictions

the survey) gave conditions for telemedicine: for 15 (60% of those who responded) it was the possibility of a face-to-face visit when needed, for 7 (28%) continuation of therapy, for 2 (8%) trouble-free calling, and for 1 (4%) regular diagnostic tests. The reasons for these conditions were: psychological factors, mainly the feeling of safety and better care during face-to-face visits (n=2; 8%), the respondents' belief in better diagnostics during face-to-face visits (n=10; 38%), the belief that this is due to the patient because they pay (n=1; 4%); 13 people (50%) did not justify the statements. The suggestions for improvement made by the respondents are shown in Table 2.

**Comparison of patients having and not having an opinion on telemedicine in HIV care.** Further we have compared patients with opinion on the future of telemedicine in HIV care (77; 49%) and those responding that they had no opinion at all (79; 51%). Their characteristics are shown in Table 3.

The distribution of education and age were significantly related to having or not an opinion on telemedicine. People with higher education were more likely to have a clear opinion than people with other levels of education, while people with secondary education were more likely to have no opinion than people with other types of education. Age was only significant when categorised: people <50 years of age

were less likely to have a clear opinion than people >50 years of age (33% vs. 67%,  $P=.04$ ).

The distribution of gender, place of residence, sexual orientation, time since diagnosis, place of first test, declared willingness to start treatment within 7 after infection was not significantly different among respondents having a clear opinion on the future of telemedicine or not.

In univariate logistic regression models the only significant factors associated with the odds of not having an opinion were: primary education (OR=4.47 [95% CI 2.13-9.40],  $P=.0001$ ), access to telemedicine only (0.30 [95% CI: 0.09 to 0.98],  $P=.04$ ), and difficulties in getting a visit (0.50 [95% CI: 0.24 to 1.06],  $P=.07$ ). While including these factors into multivariate logistic regression model (n=152) these factors remained significant: for primary education (5.37 [95% CI: 2.44 to 11.82],  $P<.0001$ ), difficulties in getting a visit (0.35 [95% CI: 0.15 to 0.81],  $P=.01$ ), and access to telemedicine only (0.20 [95% CI: 0.06 to 0.72],  $P=.01$ ) (p-value for the whole model:  $P<.0001$ ), Table 4.

## DISCUSSION

This study is the first to evaluate patients perspective on introducing telemedicine in HIV care

in Poland. We present that majority of patients who had an opinion, had positive opinion in relation to delivering HIV care during times of pandemic and the use of telemedicine. At the same time we present that 51% of respondents had no opinion on the future of telemedicine in HIV care. The only factor significantly increasing the lack of opinion, by over five folds, was lower level of education. In turn, persons with access to HIV care during pandemic only through telemedicine and reporting difficulties in getting a face-to-face visit were less likely not to have an opinion. This indicates that until recently telemedicine was used only in narrow and specialized population of patients, therefore the concept is largely unknown to majority of Polish population including HIV patients (4,5,12).

In a systematic review of published literature performed by Glinkowski et al. of 129 eligible articles available until July 2015 most concerned cardiology (16%), family medicine (15%) and pathology (11%). In addition the authors concluded that number of scientific publications in this field in Poland is much lower than the one expected for the country of this size, and lower than in other European countries (4). However it is also claimed that psychiatry was a leading specialty to present usefulness of telemedicine in Poland (13,14).

On the other hand another work from Poland presented that of 308 undergraduate nursing students over 80% correctly identified the definition and concept of telemedicine and almost 70% would appreciate adding telenursing to their future practice (15). Both medical doctor and nurses in Poland are authorized, based on relevant law acts, to provide services in the form of telemedicine (5,16). However as identified recently, telemedicine requires building IT competence among medical staff which might not be available due to low expenditure from general budget devoted to healthcare in Poland (17). Additional obstacle is introducing a new tools and delegating medical staff for training during pandemic when workforces in infectious diseases are significantly reduced (9).

While reviewing the full spectrum of responses in our study a significant gender related difference was observed. The variation by demographic variables, such as gender was also observed by other studies (18). In our study one in three women and only one in ten men stated that telemedicine unconditionally had a future in HIV care. This could indicate different social roles and additional burden to women living with HIV, as well as women's vulnerability in crisis like pandemic. Delivering healthcare through electronic services or indirect contact might level of this inequalities in health (19).

It is worrying that respondents living in rural areas, the ones which seem to benefit more from telemedicine, had rather negative opinion towards the future of

telemedicine in their HIV care. This may indicate that despite significant development of tele technologies and access to devices such as smartphones, it might not be equal across different patient populations, such as persons living in rural areas, elderly or unemployed.

The in depth analyses of a qualitative model and open-end questions identified that respondents don't see a need for personal visits and that they cause inconvenience. In addition, respondents gave constructive suggestions for telemedicine use, namely to keep at the same time the unlimited possibility for a face-to-face visits when needed and easy access to visits over the phone or internet. As depicted by other studies telemedicine has often been found more acceptance from patients than healthcare providers (18).

Although the majority of respondents provided postulates on how to improve the quality of HIV services during the COVID pandemic, it was not possible to identify a single area for intervention. Moreover, some of the comments were not meeting the realities of work under epidemic pressure (eg. requesting "longer hours for clinic work" and "more doctors"), or existing legal barriers in the system (eg. "drugs delivered by a pharmacy"). This underlines that respondents are to some extent not familiar with the way healthcare system works in Poland and that there is still space for education in this area. With the low level of expenditures on healthcare, not allowing to higher social workers or medical coordinators, nongovernmental organizations could supplement the system, facilitate the process of understanding the ways current system works and guide the patients throughout sometimes too complicated procedures.

Another observation is that some postulates were contradicting each other, eg. ten respondents requested for "more frequent consultations" and six indicated the need for "less frequent visits". This underlines the need for individualization and adapting to current needs and abilities of the patient, especially the one with a chronic condition. However the current system of reimbursement does not allow for flexibility in spending allowing only for a fixed rate per capita (20).

Telehealth is simply a tool and as such would work to the best ability of both end users. In primary care it enables and supports patient-centered care, a concept long used and supported in HIV care (21). Although outcomes data for telemedicine are limited they suggest that such interventions are generally at least as effective as traditional care (18). An unexplored yet tempting area of telehealth use is integrating workplace, home, healthcare clinics and communities (22). This could provide a new space for peer support activities, as well as connect patients with nongovernmental organizations. In HIV care



there seems to be underestimated potential to address many of the challenges that people living with HIV are facing.

## CONCLUSIONS

The SARS-CoV-2 outbreak naturally speed up the process of introduction of telemedicine to Polish healthcare market, especially in the area of public payer medical services. This refers specifically to patient from a vulnerable populations, as well as those with chronic diseases being in long-term care (23). Although over 60% of respondents with opinion identified potential for telemedicine in HIV care, half of them indicated specific conditions necessary to introduce it. The evaluation of timely and effective disease management via telemedicine, as well as patients' and providers' acceptance to this form of care needs to be supervised and adequately corrected to patients' reported outcome measures.

## Data availability

*Data are available upon request from a corresponding author.*

## Authors' contribution

*JDK, ES – Conceptualization (equally); JDK, PM, IZM – Data curation; IZM – Formal analysis; ES, PM – Funding acquisition; JDK, MAB, IG – Investigation; JDK, MAB – Methodology; JDK, ES, PM – Supervision; JDK, IZM – Validation; IZM – Visualization; JDK, IZM – Writing original draft; JDK, ES, PM, MAB, IZM, IG – Writing, review and editing. All authors read and approved the final manuscript.*

## Conflict of interest

*The authors disclose no conflict of interest in relation to this work.*

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## Ethical approval

*According to the local law there is no requirement to obtain Bioethical Committee approval for the survey study with anonymized data.*

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