



Telemedicine and intraductal papillary mucinous neoplasms: Analysis of a new follow-up strategy during COVID-19 outbreak



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ABSTRACT

Background: The Coronavirus pandemic outbreak in 2019 and the saturation of healthcare system led to an increased use of digital tools for surveillance. In this study we described our experience using telemedicine to follow-up on patients with intraductal papillary mucinous neoplasms during the COVID-19 era and analyze those factors associated to patients' satisfaction.

Methods: This 1-year retrospective observational study enrolled patients with intraductal papillary mucinous neoplasms followed-up by telemedicine during COVID-19 outbreak. Patients with high-risk features needing on-site physical examination or declining remote follow-up were excluded.

A 13-question survey was conducted; demographic, geographic, and employment information was collected. Univariate and multivariate analyses were performed to evaluate those factors associated to patients' satisfaction.

Results: Out of 287, a total of 177 patients with intraductal papillary mucinous neoplasms were included: the mean age was 69 (44–87) years and the male/female ratio was 0.78. A total of 80 (45.2%) patients had previously experienced abdominal pain. Most patients (85.3%) were satisfied with telemedicine: at univariate analysis, age ≥ 70 years ($P = .007$), retirement ($P = .001$), and absence of previous abdominal pain ($P = .05$) were significantly associated with patient satisfaction. At multivariate analysis, the absence of previous abdominal pain was the only factor independently associated with patient satisfaction (odds ratio 5.964, 95% confidence interval 2.21–16.11, $P < .001$).

Conclusion: Telemedicine allows a new follow-up strategy that can be used in selected patients with intraductal papillary mucinous neoplasms. The absence of previous abdominal pain is associated with patient satisfaction during follow-up. Further studies are needed to evaluate safety of remote follow-up in patients with intraductal papillary mucinous neoplasms.

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Introduction

The COVID-19 outbreak produced devastating consequences on patients, health systems, and economies worldwide¹ requiring extraordinary measures to control the pandemic such as lockdowns, sealed country borders, and stay-at-home orders.

Telemedicine has been widely used to deliver health care services when distance is a critical factor,² especially for those patients

who live in rural areas or with mobility restrictions.³ It has been demonstrated that telemedicine is feasible and easy to use,^{4,5} decreases travel and wait times,^{6,7} and increases access to healthcare and medication adherence.^{4,8}

Spain was one of the most affected countries during the first wave of COVID-19 (Mar to Jun 2020). With 861,112 positive cases and >63,000 healthcare workers infected, this crisis magnified the weaknesses in some parts of Spain's health system.⁹

Following government recommendations, we decided to implement a telemedicine follow-up program for those patients requiring long-term follow-up, such as intraductal papillary mucinous neoplasms (IPMN).

The IPMNs are mucin-filled dilated ducts lined with neoplastic cells forming papillae with a diverse range of morphologies and

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varying grades of atypia.¹⁰ Since described in 1996 by the World Health Organization, the understanding of its histopathologic features and the prevalence of associated invasive pancreatic adenocarcinoma has been the main objective of the different studies.¹¹ The IPMNs have risk of malignant transformation, ranging from 19% to 30% in branch-duct IPMN (BD-IPMN), and as high as 40% to 60% in main-duct IPMN (MD-IPMN).¹²

According to European guidelines, surgical resection should be performed in patients who show high-risk features or those with relative risk who are fit for surgery; lifelong follow-up is recommended in patients without any worrying features.¹³ The timing and frequency of progression to invasive carcinoma are unknown and therefore patients are followed-up for years. Although the diagnostic performance for the prediction of malignant IPMN with contrast-enhanced computed tomography (CT) and pancreatic magnetic resonance imaging (MRI) are comparable,¹⁴ MRI is recommended to follow-up these patients and reduce radiation exposure.¹⁵

The aim of this study was to demonstrate that telemedicine was a useful tool to follow-up patients with IPMN during COVID-19 pandemic. We also analyzed those factors associated with patients' satisfaction.

Methods

This was a retrospective study performed at a tertiary care, large-volume, academic center.

Data collection

Data collection took place retrospectively after telemedical follow-up evaluation was performed. Demographic and social variables were collected. Age >70 years, retirement from work, and whether the patient was referred from centers outside Hospital Service Area were also considered. Diabetes, smoking status, and previous occurrence of abdominal pain were collected.

Follow-up consisted of a 20-minute interview by phone call for each patient every 6 months. Blood tests including carbohydrate antigen 19-9 levels and pancreatic MRI were discussed.

This survey was conducted orally as during intermittent lockdown patients were not allowed to send the questionnaires by ordinary mail and older patients might have struggled with digital versions. We administered the survey from June 2021 to September 2021. European guidelines on pancreatic cystic lesions⁴ were used to follow-up with patients with IPMN.

The survey was conducted by surgical residents or research fellows, to mitigate the bias of favorable answers.

Patients were allowed to attend the hospitals in case of previously scheduled tests; only those tests scheduled from March 2020 to May 2020 (complete lockdown) were delayed. Patients were asked to describe any new clinical symptoms and then to complete the survey. In case of need to complete the assessment by on-site visit due to a clinical or radiologic change, patients were scheduled for an outpatient visit or were advised to attend the emergency department.

Inclusion and exclusion criteria

All patients aged ≥ 18 with a radiologic diagnosis of IPMN who had a telemedicine follow-up consultation appointment between 1 March 2020 and 1 March 2021, were reviewed retrospectively and then asked to answer a survey. Patients with the new diagnosis of IPMN were excluded. Patients with high-risk features needing on-site physical examination or those who refused remote follow-up

were excluded. All patients included were provided with oral informed consent by phone call.

Survey

We designed a 13-question survey for patients presenting with IPMN using questions with closed responses using a 5-point scale (1-Completely agree, 2-Agree, 3-Neutral, 4-Disagree, 5-Strongly disagree). The questionnaire used for this survey was previously validated in telemedicine studies¹⁶ and in the Spanish language.¹⁷ English translation of the survey is showed in [Figure 1](#).

The following items were analyzed in this survey: feasibility (4 questions); current and future preference for telemedicine (4 questions); medical accessibility (2 questions); benefits (1 question); concerns (1 question); and general satisfaction (1 question).

Statistics

Descriptive statistics were performed to characterize demographic variables. Univariate and multivariate analysis were performed using binary logistic regression to adjust potential confounders and to identify the factors associated with patient satisfaction with telemedicine follow-up. All data were collected and evaluated anonymously, and statistical analysis was performed using SPSS version 25 (IBM SPSS, Inc, Armonk, NY).

Ethics

This study was approved by the ethical review board of Hospital Clinic with identification number HCB/2022/0095.

Results

A total of 287 patients with a diagnosis of IPMN were followed-up in our clinic during the COVID-19 pandemic outbreak (from Mar 2020 to Mar 2021). Of 287, 25 (8.7%) refused or were unable to participate in our study, 76 (26.5%) received only on-site outpatient visits, and 9 (3.14%) patients died during the study (unrelated to IPMN). A total of 177 (61.7%) patients received a telemedicine follow-up and gave consent for study participation ([Figure 2](#)). The baseline characteristics are presented in [Table 1](#).

The median age was 70 (44–87) years, the male/female ratio was 0.78, and 70 (39.5%) patients were referred from regional hospitals outside the Barcelona area. Eighty (45.2%) patients had previously experienced abdominal pain (before the survey), and 113 (63.8%) were retired from work.

Of those 177, the baseline characteristics included 24 (13.6%) patients with relative indications for surgery: 18 patients showed stable <10 mm pancreatic duct dilatation (including 10 patients with previous acute pancreatitis possible related to IPMN); 2 showed growth rate >5 mm/year of side branch IPMN, and 4 patients with main pancreatic duct >10 mm (absolute indication) rejected surgery but were followed-up.

During the study time, 20 patients were scheduled for an on-site visit due to clinical or radiologic changes and 12 (6.8%) patients underwent surgery due to appearance of absolute indications (6 of them with known SB-IPMN).

Survey

The answers were grouped according to whether their results were in favor, neutral, or against the statements.

1. I was able to give all the information that I needed.
2. The physician paid attention to my questions.
3. There was not enough time for the visit.
4. I felt comfortable using telemedicine for the consultation.
5. Telemedicine helps the access to the medical health system.
6. Telemedicine reduced waiting time to visit.
7. Telemedicine was money-saving compared to on-site consultation.
8. During the medical visit I was worried about someone else listening.
9. I find acceptable to receive follow-up using telemedicine.
10. I think that telemedicine might be better than on-site visits for my disease.
11. I am willing to do follow-up of my pathology using telemedicine.
12. I think that a good option would be to alternate telemedicine with on-site visits.
13. In general, I am satisfied with the telemedicine.

Figure 1. Survey.

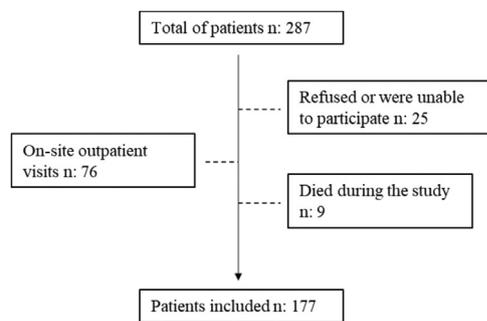


Figure 2. Study flow diagram.

Table I
Baseline characteristics

Characteristics	N = 177
Median age, y (range)	70 (44–87)
Age >70 y	91(51.4%)
Male/female ratio	0.78
Diabetes n (%)	26 (14.7%)
Smoker n (%)	32 (18.1%)
Retired n (%)	113 (63.8%)
Referral from centers outside hospital service area n (%)	70 (39.5%)
Previous abdominal pain n (%)	80 (45.2%)
Underwent surgery due to IPMN progression	12 (6.8%)

IPMN, intraductal papillary mucinous neoplasms.

Feasibility

This part of the survey was determined to evaluate the feasibility of performing telemedicine consultations. In this part of the survey, 4 questions were asked. The statements were “I was able to give all the information that I needed,” “The physician paid attention to my questions,” “There was not enough time for the visit,” and “I felt comfortable using telemedicine for the consultation.”

The results showed that patients were able to give all information (87% agree), the physician paid attention (96% agree), there was enough time for the visit (59.3% agree), and patients were comfortable using telemedicine (Supplementary Figures 1–4).

Medical accessibility

The second part of the survey was determined if patients perceived that telemedicine reduced wait times or costs. The results showed that patients believed telemedicine helps to access medical health system (66.7% agree), but they do not believe it reduces the wait time to visit (47.5% neutral answer) (Supplementary Figures 5 and 6).

Benefits

To study the direct benefits for the patients, we stated that using telemedicine reduced costs for the patients showing that 81 (45.8%) agree with it and 79 (44.6%) gave a neutral answer (Supplementary Figure 7).

Concerns

To investigate the concerns, we asked patients if they felt worried about someone else listening to their conversation and 133 (75.1%) disagreed with it (Supplementary Figure 8).

Current and future preferences for telemedicine

In this part we evaluated current and future preferences for telemedicine and 4 questions were asked. The statements were “I find acceptable to receive follow up,” “I think that telemedicine might be better than on-site visits for my disease,” “I am willing to do follow-up of my pathology using telemedicine,” and “I think that a good option would be to alternate telemedicine with on-site visits.”

The results showed that patients find it acceptable to do follow-up with telemedicine (70%), doubt whether it is a better option than on-site visits (34.5% neutral) and are willing to do follow-up using telemedicine (63.8%) or to alternate it with on-site visits (84.7%) (Supplementary Figures 9–12).

Telemedicine satisfaction

To evaluate the general experience of patients, we asked if they were satisfied with telemedicine. In response to that, 151 (85.3%) of them answered they completely agree or agree with it, 19 (10.7%) gave a neutral answer, and 7 (4%) disagreed with it (Supplementary Figure 13). All results of the survey are summarized on Table II.

Univariate analysis and multivariate analysis

Univariate and multivariate analysis were performed to analyze factors associated with telemedicine satisfaction (question no. 6). At univariate analysis, age ≥ 70 years ($P = .007$, 95% CI 1.02–1.11), retirement ($P = .011$, 95% CI 1.29–7.08), and absence of previous abdominal pain ($P = .05$, 95% CI 0.98–5.3) were significantly associated with patient satisfaction.

There was no collinearity between age >70 and retirement (Variance Inflation Factor 8, tolerance 0.6).

We included in the multivariate model age ≥ 70 years, retirement, and absence of abdominal pain. The only factor that was associated with patients’ satisfaction was the absence of previous abdominal pain with an odds ratio of 5.96 (95% CI 2.21–16.11, $P < .001$). There was no association with retirement OR 2.42 (95% CI 0.69–8.77, $P = .162$) nor with age ≥ 70 years OR 1.07 (95% CI 0.28–4.07, $P = .917$). The results of univariate and multivariate analysis are presented in Table III.

Table II
Survey results

			Agree	Neutral	Disagree
Feasibility	1	I was able to give all the information that I needed	154 (87%)	11(6.2%)	12 (6.8%)
	2	The physician paid attention to my questions	170 (96%)	5(2.9%)	2 (1.1%)
	3	There was not enough time for the visit	48 (27.1%)	24(13.6%)	105 (59.3%)
Medical accessibility	4	I felt comfortable using telemedicine for the consultation	146 (82.5%)	15(8.5%)	16 (9%)
	5	Telemedicine helps the access to the medical health system	118 (66.7%)	48(27.1%)	11 (6.2%)
	6	Telemedicine reduced waiting time to visit	73 (41.2%)	84(47.5%)	20 (11.3%)
Benefits	7	Telemedicine was money-saving compared to on-site consultation	81 (45.8%)	79(44.6%)	17 (9.6%)
Concerns	8	During the medical visit I was worried about someone else listening	9 (5.1%)	35(19.8%)	133 (75.1%)
Current and future preferences	9	I find acceptable to receive follow-up using telemedicine	124 (70%)	27(15.3%)	26 (14.7%)
	10	I think that telemedicine might be better than on-site visits for my disease	56 (31.6%)	61(34.5%)	60 (33.9%)
	11	I am willing to do follow-up of my pathology using telemedicine	113 (63.8%)	29(16.4%)	35 (19.8%)
Telemedicine satisfaction	12	I think that a good option would be to alternate telemedicine with on-site visits	150 (84.7%)	15(8.5%)	12 (6.8%)
	13	In general, I am satisfied with the telemedicine	151 (85.3%)	19(10.7%)	7 (4%)

Table III
Univariate and multivariate analysis

	Univariate analysis		Multivariate analysis			
	P value	95% CI	Wald	P value	Odds ratio	95% CI
Sex	<i>P</i> = .817	CI 0.48–2.55				
Age ≥70 y	<i>P</i> = .007*	CI 1.02–1.11	0.011	<i>P</i> = .917	1.07	0.28–4.07
Retirement from work	<i>P</i> = .011*	CI 1.29–7.08	1.959	<i>P</i> = .162	2.42	0.69–8.77
Outside Barcelona area	<i>P</i> = .755	CI 0.37–2.03				
Absence of abdominal pain	<i>P</i> = .05*	CI 1.01–5.3	12.404	<i>P</i> < .001*	5.96	2.21–16.11
Relative indication for surgery at baseline	<i>P</i> = .190	CI 0.76–4.08				

Bold/* means statistically significant.

Discussion

The COVID-19 outbreak had a significant impact across health-care, economy, and society. As government regulations based on social distancing and lockdowns were approved, healthcare needed to adapt to provide patients' care. Physicians and health systems worldwide adopted social distancing methods in order to protect both patients and physicians.¹⁶

Many hospitals performed a shift to telemedicine, thereby decreasing the exposure for patients and medical staff serving on the front lines.¹⁷ This strategy has been proved to be successful in other countries such as the United States or Italy that have shown successful telemedicine shifting rates in different specialties between 60% and 95%.^{18–20} Cost analysis has previously been performed showing that telemedicine consultations are cost saving and that telemedicine costs decrease with usage.²¹

To understand more about patients' preferences and feasibility of telemedicine for follow-up, we conducted a 13-question survey on the 177 patients with IPMN that were attended in 1-year period using telemedicine. Our results confirmed earlier studies of successful results about patients' satisfaction through telemedicine follow-up.^{22,23} Furthermore, the responses received from participants indicated no concerns about privacy and several favorable outcomes about feasibility, medical accessibility, and future perspectives of telemedicine implementation.

This was the first study that analyzed the predictive factors for successful telemedicine follow-up in patients with IPMN. In this study, we found that the only predictive factor for telemedicine satisfaction was the absence of previous abdominal pain, as we believe the fear of presenting pain is the only factor that prevents the acceptance of telemedicine follow-up. However, we also think that some potentially contributing factors could have been missed by our retrospective survey.

Although at univariate analysis, retirement and age >70 years were statistically significant, they were not associated with satisfaction in the multivariate analysis. Older patients with no driver's license are reliant on either family members or other forms of transport to access healthcare services, which leads to an indirect or direct economic cost. However, we believe those factors were eventually not significant as public health service is keen to provide free transport for patients with logistic problems. Other demographic factors, comorbidities, or living areas were not associated with satisfaction.

Interestingly, we observed that by using telemedicine our no-show rate in the outpatient clinic dropped to nil: we think telemedicine helped to reduce mainly no-show rate secondary to administrative issues (the patient did not correctly receive the scheduled appointment), patient's forgetfulness, and last-minute logistic problems.

It would have been interesting to perform an objective evaluation of clinician experience. Unfortunately, most of these patients were followed up by the senior author only (F.A.) and therefore we could not perform a proper survey. The feeling was extremely positive, because there were no safety issues; however, we should consider that this survey was conducted in selected patients who accepted to participate. We are now planning a multicenter study on this topic which will include the clinician experience.

This study had some limitations. First, this was an observational study conducted in an unusual setting of a pandemic outbreak and with governmental regulations advocating to reduce face-to-face visits. Although telemedicine was available earlier, due to the pandemic it was highly promoted. Second, this study was focused on patients with IPMN, which is a chronic disease that requires years of follow-up not requiring in most cases physical exploration, so we could not assure results would be the same in other pathologies. Third, this was a retrospective survey and therefore there was a significant risk of recall bias; because patients were followed

up on a 6-monthly basis, the average time from remote follow-up to survey would be approximately 3 months: we tried to mitigate this bias by using a careful selection of research questions and choosing an appropriate data collection method.

In conclusion, despite these limitations, this study suggested that, with some patient selection, a telemedicine-based follow-up may appear in the next few years. Future research needs to be performed to identify factors for patient selection and the potential effect in patients' health status.

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Conflict of interest/Disclosure

The authors have no conflicts of interests or disclosures to report.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [<https://doi.org/10.1016/j.surg.2022.09.005>].

References

1. Bong CL, Brasher C, Chikumba E, McDougall R, Mellin-Olsen J, Enright A. The COVID-19 pandemic: effects on low- and middle-income countries. *Anesth Analg*. 2020;131:86–92.
2. World Health Organization (WHO) Group Consultation on Health Health Telematics. A health telematics policy in support of WHO's Health-for-all strategy for global health development: report of the WHO Group Consultation on Health Telematics, 11-16 December, Geneva, 1997. <https://apps.who.int/iris/handle/10665/63857>.
3. Kruse CS, Krowski N, Rodriguez B, Tran L, Vela J, Brooks M. Telehealth and patient satisfaction: a systematic review and narrative analysis. *BMJ Open*. 2017;7:e016242.
4. Georgsson M, Staggers N. Quantifying usability: an evaluation of a diabetes mHealth system on effectiveness, efficiency, and satisfaction metrics with associated user characteristics. *J Am Med Inform Assoc*. 2016;23:5–11.

5. Polinski JM, Barker T, Gagliano N, Sussman A, Brennan TA, Shrank WH. Patients' satisfaction with and preference for telehealth visits. *J Gen Intern Med*. 2016;31:269–275.
6. Langabeer JR, Gonzalez M, Alqusairi D, et al. Telehealth-enabled emergency medical services program reduces ambulance transport to urban emergency departments. *West J Emerg Med*. 2016;17:713–720.
7. Oliveira TC, Bayer S, Gonçalves L, Barlow J. Telemedicine in Alentejo. *Telemed J E-Health*. 2014;20:90–93.
8. Breen P, Murphy K, Browne G, et al. Formative evaluation of a telemedicine model for delivering clinical neurophysiology services part I: utility, technical performance and service provider perspective. *BMC Med Inform Decis Mak*. 2010;10:48.
9. The Lancet Public Health. COVID-19 in Spain: a predictable storm? *Lancet Public Health*. 2020;5:e568.
10. Su GH, ed. *Pancreatic Cancer: Methods and Protocols*. third edition. Totowa, NJ: Humana Press; 2019.
11. Peters N, Kunstman JW. Clinical implications of the molecular characterization of intraductal papillary mucinous neoplasms of the pancreas. *J Cancer Metastasis Treat*. 2021;7:32.
12. Fonseca AL, Kirkwood K, Kim MP, Maitra A, Koay EJ. Intraductal papillary mucinous neoplasms of the pancreas: current understanding and future directions for stratification of malignancy risk. *Pancreas*. 2018;47:272–279.
13. del Chiaro M, Besselink MG, Scholten L, et al. European evidence-based guidelines on pancreatic cystic neoplasms. *Gut*. 2018;67:789–804.
14. Lee JE, Choi SY, Min JH, et al. Determining malignant potential of intraductal papillary mucinous neoplasm of the pancreas: CT versus MRI by using revised 2017 international consensus guidelines. *Radiology*. 2019;293:134–143.
15. Sodickson A, Baeyens PF, Andriole KP, et al. Recurrent CT, cumulative radiation exposure, and associated radiation-induced cancer risks from CT of adults. *Radiology*. 2009;251:175–184.
16. Webster P. Virtual health care in the era of COVID-19. *Lancet*. 2020;395:1180–1181.
17. Wijesooriya NR, Mishra V, Brand PLP, Rubin BK. COVID-19 and telehealth, education, and research adaptations. *Paediatr Respir Rev*. 2020;35:38–42.
18. dell'omo R, Filippelli M, Virgili G, et al. Effect of COVID-19-related lockdown on ophthalmic practice in Italy: a report from 39 institutional centers. *Eur J Ophthalmol*. 2022;32:695–703.
19. Hemingway JF, Singh N, Starnes BW. Emerging practice patterns in vascular surgery during the COVID-19 pandemic. *J Vasc Surg*. 2020;72:396–402.
20. Blue R, Yang AI, Zhou C, et al. Telemedicine in the era of coronavirus disease 2019 (COVID-19): a neurosurgical perspective. *World Neurosurg*. 2020;139:549–557.
21. Ahmed SN, Mann C, Sinclair DB, et al. Feasibility of epilepsy follow-up care through telemedicine: a pilot study on the patient's perspective. *Epilepsia*. 2008;49:573–585.
22. Hicks LL, Boles KE, Hudson S, et al. Patient satisfaction with teledermatology services. *J Telemed Telecare*. 2003;9:42–45.
23. Nguyen M, Waller M, Pandya A, Portnoy J. A review of patient and provider satisfaction with telemedicine. *Curr Allergy Asthma Rep*. 2020;20:72.

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