Patient Asynchronous Response to Coronavirus Disease 2019 (COVID-19): A Retrospective Analysis of Patient Portal Messages

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Introduction: With the advent of Coronavirus Disease 2019 (COVID-19), millions of non-urgent and non-COVID-19 medical encounters were postponed or cancelled by patients and health systems to reduce the risk of COVID-19 infection during in-person visits and prevent the virus spread [1, 2]. For continued healthcare access, most clinic visits have transitioned to online platforms for healthcare access including COVID-19 diagnosis and treatment [3]. Patient portals and other digital platforms hold promise as sustainable and scalable health system intervention strategies to improve access to healthcare for COVID-19 diagnosis and treatment and other healthcare issues [4]. Through the patient portals, patients can receive educational information on COVID-19 preventive care measures, use online triage forms (self-checker and E-visit) for COVID-19 symptom assessment, and send and receive portal messages related to their COVID-19 diagnostic tests and results. If the positively tested patients are at risk, patients can communicate with their providers about COVID-19 care plan. In this study, we propose to characterize patients and their use of asynchronous virtual care for COVID-19 via a retrospective analysis of patient portal messages. The findings can provide insights into the frequency of portal messaging utilization by patients for addressing COVID-19 crisis and impact on patients with respect to COVID-19 related concerns.

Methods: We collected over 2 million portal messages generated by patients between February 1 and September 20, 2020 at Mayo Clinic, a large multi-specialty academic health system. We filtered the patient-generated messages (PGMs) associated with COVID-19 using relevant keywords (e.g., COVID-19, Pandemic, Coronavirus, SARS-CoV-2, and 2019-nCoV) and their synonyms and morphological variations. We then analyzed the distribution of different patient populations by stratifying the unique patients with respect to their personal and social conditions including age, gender, marriage, ethnicity, race, language, and residence and calculated the daily numbers of total PGMs on COVID-19. We summarized reasons for patient utilization of portal messages for accessing COVID-19 related care such as diagnosis, testing, and treatment and seeking supports for various issues including appointment postponement and mental health problems due to COVID-19. We analyzed the PGMs used for assessing COVID-19 symptoms and discussing COVID-19 diagnostic tests and results and care plan to understand the message use for COVID-19 diagnosis and treatment. In addition, we examined other healthcare issues caused by COVID-19 reported in the portal messages to understand COVID-19 impacts on health services and patients.

Results: The majority of PGMs on COVID-19 pertained to COVID-19 symptom self-assessment (42.53%) and COVID-19 tests and results (32.44%) (See **Table 1**). As shown in **Figure 1**, The PGMs on COVID-19 symptom self-assessment and COVID-19 tests and results had dynamic patterns (two peaks and three surges) similar to the newly confirmed cases in the US and Minnesota. The trend of PGMs on COVID-19 care plan is in good agreement with that of newly hospitalized cases and deaths. After an initial increase in March, the PGMs on issues such as cancellations and anxiety regarding COVID-19 had a declining trend (See **Figure 2**). Patients who were 30-64 years old, married, female, white, or urban residents were more likely to send portal messages. The messaging disparity was exacerbated among patients who sent portal messages on COVID-19.

Conclusion: During the COVID-19 pandemic, patients increased portal messaging utilization to address healthcare issues about COVID-19 (particularly, symptom self-assessment and tests and results). The portal messages on COVID-19 could reflect the overall development of COVID-19 and its impact on patients over time. The use disparity of patient populations indicates an opportunity to increase patient engagement in patient portals for minority and rural populations for addressing COVID-19 crisis.

Table 1 Numbers and percentages of PGMs on COVID-19 related care and other healthcare issues

Theme	Category	PGMs on COVID-19 (N=403,116)	
		Count	Percentage
COVID-19 related care	Self-checker	171,438	42.53
	E-visit	4,619	1.15
	Tests & results	130,771	32.44
	Care plan	4,202	1.04
Other issues caused by the COVID-19 pandemic	General issues	13,793	3.42
	Postponement	29,023	7.20
	Cancellation	20,266	5.03
	Anxiety	22,671	5.62
	Depression	4,039	1.00
	Suicidal ideation	300	0.07

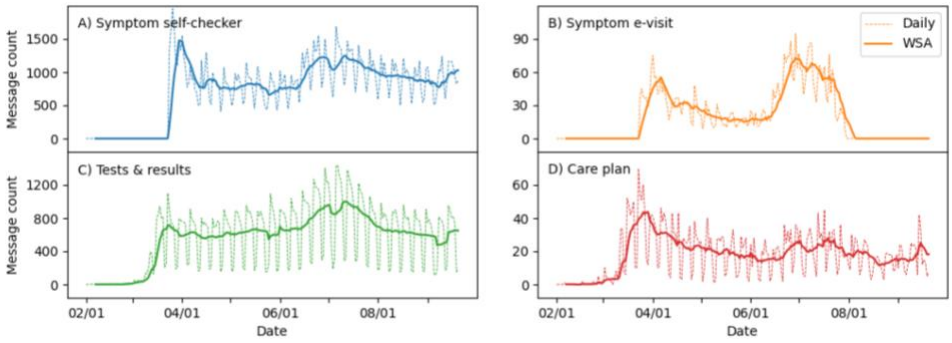

Figure 1 Daily numbers and weekly smoothing averages (WSAs) of PGMs on COVID-19 related care (diagnosis and treatment) – (A) COVID-19 symptom assessment via self-checker, (B) COVID-19 symptom assessment by providers via e-visit, and discussions on COVID-19 tests and results (C) and care plan (D)

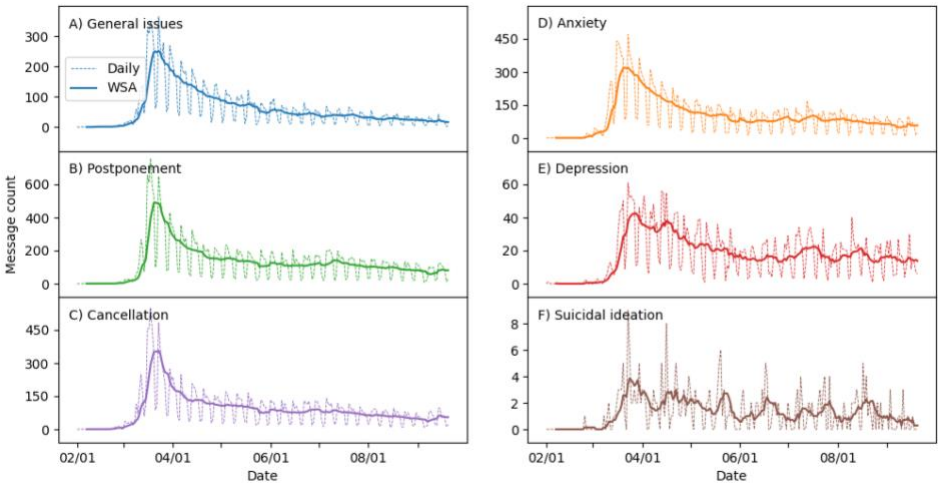

Figure 2 Daily numbers and weekly smoothing averages (WSAs) of PGMs on COVID-19 related other healthcare issues – (A) general issues due to COVID-19, (B) postponement, (C) cancellation, (D) anxiety, (E) depression, and (F) suicidal ideation

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