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ORIGINAL ARTICLE

# Creation of a Multispecialty Clinic for Patients with Central Sensitization–Based Chronic Pain Conditions

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## Abstract

**Objective:** To design and evaluate, through a human-centered design approach, a multispeciality clinic for patients with central sensitization syndromes that combined virtual previsit consultations, traditional face-to-face appointments, and technology-enabled educational programming.

**Patients and Methods:** Patients with suspected fibromyalgia and chronic abdominal pain were seen in a multispecialty practice, and the performance of the clinic was evaluated against a contemporary cohort. Quantitative and qualitative evaluation measures included team estimates of time spent on care-related tasks, physician rank of alignment of patient need with clinic design, major appointment changes, and nonvisit care tasks. Members of the care team also evaluated strengths, weaknesses, opportunities, and threats to the success of the clinic.

**Results:** The pilot clinic was operated from April 1, 2020, to April 30, 2021, and included 34 patients with suspected fibromyalgia/chronic abdominal pain. During the pilot period, physicians ranked the value of the virtual previsit consultations in providing care as 7.5 on a scale of 0 to 10 and reported an average of 50 minutes in preparation for the appointment, execution of the appointment, and postvisit documentation. We did not observe substantial differences in the number of added appointments or messages received within the patient portal when compared with a comparison cohort. Patients who participated in the combination nurse educator–led and digital education program provided positive feedback about their experience.

**Conclusion:** Our clinic model provides a framework for the treatment of patients with debilitating centrally sensitized conditions and future expansion of virtual care delivery models to better meet patient care and educational needs.

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Central sensitization (CS) is the pathophysiologic process underlying many different conditions whereby changes in the central nervous system at structural, functional, and chemical levels lead to alterations in how the brain and spinal cord process pain and other sensory stimuli. Maladaptive changes in sensory processing lead to the development of various chronic symptoms and ultimately to CS-based conditions, collectively known as *central sensitivity syndromes* (CSS).[1-6] The most widely described CSS is fibromyalgia (FM). Fibromyalgia is a chronic centralized pain sensitivity disorder characterized by chronic, migratory, and widespread pain, fatigue, cognitive symptoms, sleep disturbance, psychological distress, and various other waxing and waning symptoms.[1-4] In the United States, the estimated prevalence of FM is approximately 2% to 8%, while the National Fibromyalgia Association estimates that approximately 10 million Americans have FM.[3] The financial costs associated with FM are staggering; the

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average financial cost of health care for patients with FM is 2 to 3 times higher than that for healthy individuals, with direct and indirect costs surpassing more than $4000 per month per individual.[7,8] Total FM-related health care costs are $10 billion annually.[3,7,9]

Beyond FM, there are many other conditions that are pathophysiologically based in CS. These conditions include, but are not limited to, irritable bowel syndrome (IBS)/chronic abdominal pain (the global prevalence of IBS is estimated to be 11%, with health care costs in excess of $20 billion annually),[10] chronic fatigue syndrome/myalgic encephalomyelitis (affecting up to 2.5 million Americans, with an associated economic cost of between $17 billion and $24 billion annually),[11] temporomandibular joint disorder (affecting approximately 5% to 12% of the US population, with medical costs exceeding $4 billion annually),[12] postural tachycardia syndrome (estimated prevalence of 0.2%),[13] and cough hypersensitivity syndrome (affecting up to 10% of all individuals with chronic cough).[14,15] As a result, the Centers for Disease Control and Prevention, the Institute of Medicine, and the Chronic Pain Research Alliance recently put forth the term *chronic overlapping pain conditions* to demonstrate the interrelatedness and shared pathophysiology (CS) of these and many other conditions.[16,17]

Unfortunately, no cures for CSS exist; the primary goals of treatment are to improve daily function, reduce symptom burden, and enhance quality of life. To achieve these goals, numerous studies have documented that the most effective treatment strategies for CSS conditions involve a combination of medication and nonmedication self-management treatment strategies.[1,3,18-22] Despite 4 decades of CSS-related scholarly progress, inherent challenges remain that affect both patients and health care professionals/institutions. These challenges include medical complexities associated with these conditions; the highly comorbid nature of CS-related conditions; the multiplicity and nonspecific nature of CSS and waxing and waning features of symptoms; patient-related delays in seeking medical care; the resultant "diagnostic odysseys" in the setting of rising health care costs; decreased appointment durations in conjunction with increased nonpatient care demands; delayed access to subspeciality care; and health care professional experience and confidence with the applicable diagnostic criteria and evidence-based treatment strategies. Despite our current knowledge of CSS, many patients and health care professionals remain dissatisfied with our current health care process for diagnosis and treatment options.[3,7,19,22-26]

Given these challenges, members of our multidisciplinary academic medical center identified inefficiencies and immediate needs in our current practice. To progress our practice, we created an innovative multidisciplinary clinic for individuals with concomitant FM and chronic abdominal pain/IBS called the complex care coordination (C3) clinic. This unique clinic was created to better address needs and expectations of this patient population via virtual previsit consultations, efficient medical appointment itineraries involving a multidisciplinary team, and evidence-based treatment. Furthermore, we created a multimodal educational program consisting of nurse-led virtual group sessions and an online self-directed educational module system, collectively called the complex care program.

In this article, we describe the conceptualization of the C3 clinic, the translation of the ideal clinic state into clinical operations, the outcomes of the iterative C3 clinic pilot, and lessons learned from our journey to better meet the needs of this complex patient population.

## PATIENTS AND METHODS

Based on the policies outlined by our institutional review board, this work met criteria for clinical practice improvement and did not qualify as research.

### Study Population and Setting

The Rochester, Minnesota campus of Mayo Clinic is an integrated outpatient and hospital-based health care delivery model serving patients from more than 140 countries and all 50 states each year. The Department of Medicine employs nearly 600 physicians who see more than 200,000 unique patients annually through our multidisciplinary care practice with general and specialty medical expertise. The Division of General Internal


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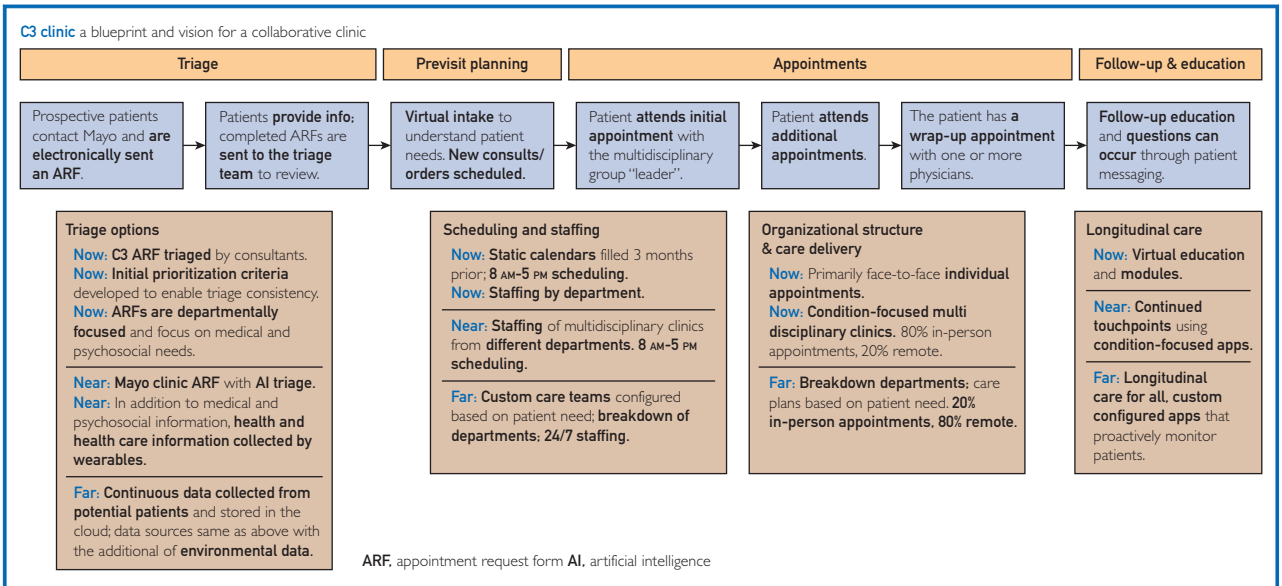


**FIGURE.** Design vision for the creation of the complex care coordination (C3) clinic. consults, consultations; info, information.

Medicine has a consultative medical model designed to provide comprehensive assessment, triage, and collation of medical expertise from across our institution for patients who travel for this service. An estimated 25% of patients seeking this service have a CS-related condition.

## Context and Clinic Conceptualization

A human-centered design approach was deployed to conceptualize how to create the C3 clinic to meet the needs of patients and physicians. A human-centered design approach is used to understand the people who are impacted by the new service or experience and design new services based on their needs.[27] Our approach has been reported previously.[28]

To begin, we conducted observations in 3 multidisciplinary clinics at Mayo Clinic and interviewed stakeholders in those clinics to learn about best practices. Common themes emerged that were shared with the team and incorporated into our design of the C3 clinic. Within the Fibromyalgia and Chronic Fatigue Clinic, we learned about the benefit of both the nurse work-up visit, during which patients could share their story in detail, and a nurse-led, multidisciplinary education program. In another clinic evaluating patients with dizziness, we were able to observe and understand predictive algorithms that were developed to both triage patients into the clinic and set a recommended itinerary of physicians who should see the patient. In the Mayo Clinic Breast Clinic, we observed purposeful multidisciplinary care coordination in which multiple physicians meet prior to seeing the patients to establish treatment recommendations that could be messaged consistently by each physician during patient interactions.

These observations and interviews led to the creation of a vision for the C3 clinic (Figure) that was used as a basis for clinic creation, pilot design, and subsequent program evaluation. We outlined practice improvement initiatives on a "now-near-far" timeline for prioritization of work efforts.

## Translation of Clinic Optimal State Into Operations

Based on the vision created for the C3 clinic, the clinical team sought to optimize 3 areas of care delivery: (1) design and implementation of a collective triage process, (2) aligning multidisciplinary clinical calendars to accommodate shared virtual appointments between general internal medicine and

gastroenterology specialty expertise, and (3) creation and implementation of a novel patient education program tailored for patients with suspected FM and chronic abdominal pain. The actions taken to translate the optimal clinic state into operations are detailed in Table 1.

## Pilot

Patients were identified by our general internal medicine consultative medicine triage team of general internists who serve in this practice. Triage team members review patient-provided information on the reason(s) a patient would like to be seen at Mayo Clinic, along with pieces of medical information gathered directly from the patient. The triage team was asked to identify patients who appeared to have co-occuring FM and chronic abdominal pain. Patients fitting this definition were then contacted by a member of the consultative medicine scheduling team and offered the opportunity to participate in the pilot. All other patients were seen within the usual framework of the consultative medicine practice. The C3 clinic pilot period began in April 2020 when the triage team identified potential patients. The first virtual and face-to-face visits started in September 2020. The last follow-up information for the pilot period was gathered in April 2021.

The C3 clinic initial cohort of patients were seen via virtual/video previsit and on site in September of 2020 with nurse-led education commencing in October. The pilot period of the C3 clinic was intended to run for at least 6 months and to collect insight on the experiences of at least 25 patients. The C3 virtual/video previsit appointments were scheduled for one half-day of each month during the clinic pilot, with the on-site clinic visits scheduled to occur at a time that met the patients' travel needs.

## Study Measures

**Virtual Previsit Consultations.** Patients who chose to participate in the C3 clinic pilot were scheduled for a virtual previsit consultation with both a general internal medicine specialist and a gastroenterologist to discuss their symptoms and plan for their on-site visit to Mayo Clinic. Through our design research observations and interviews, we concluded that connecting with patients prior to their on-site visit could help facilitate patient appointments with the correct specialists and alignment of the necessary diagnostic testing to facilitate efficient care delivery. To understand the time needed in discrete patient care tasks during these virtual previsit consultations, we requested that physicians participating in the C3 clinic pilot estimate the

**TABLE 1. Translation of Clinic Optimal State Into Operations**

| | |
|---|---|
| Triage | |
| Updated patient intake processes | Aid in identification of patients with suspected fibromyalgia and chronic abdominal pain |
| Create new triage workflows for physicians and support teams | Help facilitate patient scheduling in newly implemented clinic |
| Virtual previsit consultations | |
| Implement dual-physician virtual visit | Gather subspecialty expertise, refine patient scheduling, consolidate itinerary, and eliminate repetition of patient history |
| Set patient expectations of upcoming clinical visits | Provide clear communication about services provided within new clinic design |
| Standardize clinic note | Provide clear and concise communication among patients, physicians, and care teams |
| Education programming | |
| Create nurse-led education program to help address symptoms related to fibromyalgia and chronic abdominal pain | Provide a lower-cost, longitudinal service model that matches institutional resources with scope of practice |
| Create digital, self-directed patient education program | Provide a scalable virtual patient-centric education offering that can be completed within the patient's home |


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amount of time taken to prepare for each patient, time with each patient, and time spent in after-appointment tasks. To assess whether updated patient identification and triage mechanisms were correctly aligning patient need with clinic intent, we asked that physicians rank each patient to the clinic intent (on a 0 to 10 scale with 0 being not a good fit at all and 10 being a perfect fit). Because the dual-physician virtual/video intake assessments were a new feature, we also asked that physicians rank the value of each of these assessments (0 to 10 scale with 0 being no added value and 10 being highly valuable).

**On-site Patient Visit.** During the C3 clinic pilot, patients experienced a traditional itinerary of scheduled visits, diagnostic testing/procedures, and on-site interactions as created for all patients seen within the consultative medicine practice. To understand the impact of the C3 clinic on the on-site experience of our patients, we calculated the number of major appointment changes made while a patient was on site at Mayo Clinic for their appointments. More than 80% of patients seen within our consultative medicine practice travel greater than 100 miles for their care, so major itinerary changes can cause disruption to travel schedules and unanticipated time away from work and home. Attention to this need was a major focus in the creation of the C3 clinic. Major appointment changes included added or cancelled face-to-face appointments with a member of the care team (physician or advanced practice professional), major imaging technologies (eg, magnetic resonance imaging, computed tomography, positron emission tomography), or major procedures (eg, biopsy). Each major appointment change was included as a single count, and changes were summed across all 3 categories. We also assessed for the amount of follow-up care requested by the patient following their visit to Mayo Clinic by summing the number of unique patient portal messages received in 3 categories: patient medical advice request, patient schedule request, and patient calls to the care team. We believe these measures serve as a proxy for the completeness of our C3 clinic and subsequent educational program design compared with a contemporary cohort of patients.

**Educational Programming.** All patients seen in the C3 clinic were offered spots in a 4-hour, nurse educator—led interactive session and provided a link to a guided self-help (GSH) intervention[29] hosted online. Nurse-led education consisted of small-group courses facilitated over video technology comprising content to help patients understand their condition as well as to make connections with others experiencing similar symptom profiles. Our GSH intervention was created using Rise 360 software (Articulate Global, LLC), and content was created and designed through partnership between Mayo Clinic subject matter experts and the Mayo Clinic patient education team. Online education programming was created to have a mix of videos, animations, text, and pictures to aid in patient learning. There are 17 distinct sections included within the online education programming, including a review of the biology of CS, an overview of how self-management can aid in symptom management, and a range of self-directed symptom management approaches that patients can engage in. Examples of described self-directed symptom management approaches included management of emotions and behaviors, sleep hygiene, the role of exercise and graded movement, and nutrition. Patients can revisit the online education programming as many times as needed. To assess patient use and satisfaction with educational programming for the C3 clinic, interviews were conducted with a random sample of patients who participated.

**Other Measures and Statistical Approach.-** Patient demographic characteristics and appointment information were collected from our patient registration and scheduling databases. In order the compare the experiences of our C3 clinic patients with a similar population of patients experiencing our traditional care model, we identified a contemporary comparison cohort. Because of the limited size of the pilot, many patients who were identified as potential fits for the C3 clinic by the identification and triage team were not able to be scheduled to be seen in the C3 clinic. We utilized these patients as a contemporary comparison cohort. Patient characteristics,

**TABLE 2. Characteristics of Complex Care Coordination Clinic Pilot Population and Comparison Cohort[a,b]**

| Variable | C3 pilot patients (n=34) | Comparison cohort (n=95) | Total (N=129) | *P* value |
|---|---|---|---|---|
| Age at triage (y) | | | | .07 |
| Median | 36.5 | 47.0 | 45.0 | |
| Q1, Q3 | 23.0, 50.0 | 30.0, 57.0 | 29.0, 56.0 | |
| Range | 18.0-77.0 | 19.0-74.0 | 18.0-77.0 | |
| Sex | | | | .05 |
| Female | 30 (88.2) | 68 (71.6) | 98 (76.0) | |
| Male | 4 (11.8) | 27 (28.4) | 31 (24.0) | |
| Geographic location | | | | .53 |
| Local | 5 (14.7) | 8 (8.4) | 13 (10.1) | |
| Regional | 6 (17.6) | 15 (15.8) | 21 (16.3) | |
| National | 23 (67.6) | 72 (75.8) | 95 (73.6) | |
| Marital status | | | | .28 |
| Divorced | 1 (2.9) | 8 (8.4) | 9 (7.0) | |
| Married | 16 (47.1) | 57 (60.0) | 73 (56.6) | |
| Separated | 0 (0.0) | 1 (1.1) | 1 (0.8) | |
| Single | 16 (47.1) | 28 (29.5) | 44 (34.1) | |
| Widowed | 1 (2.9) | 1 (1.1) | 2 (1.6) | |
| Race | | | | .31 |
| African American | 0 (0.0) | 2 (2.1) | 2 (1.6) | |
| American Indian/Alaskan Native | 1 (2.9) | 0 (0.0) | 1 (0.8) | |
| Other | 1 (2.9) | 2 (2.1) | 3 (2.3) | |
| White | 32 (94.1) | 91 (95.8) | 123 (95.3) | |

[a]CE, complex care coordination; Q1, first quartile; Q3, third quartile.
[b]Data are presented as No. (percentage) of patients unless indicated otherwise.

changes to patient appointments, and messages to the care team were compared using bivariate analyses including the $\chi^2$ test of independence and the Student *t* test, as appropriate. Differences between our C3 clinic pilot patients and our contemporary comparison cohort were considered significant at a value of $P<.05$. All data management and analyses were performed using SAS statistical software, version 9.2 (SAS Institute).

## RESULTS

Over the C3 clinic pilot period, a total of 337 patients were identified by the triage team as a potential fit for the C3 clinic, 41 of whom proceeded to have virtual previsit consultation with our C3 physician team. Of these 41 patients, 7 did not complete the C3 clinic process for various reasons (eg, being referred to a more appropriate physician during the virtual previsit consultation), leaving a total of 34 patients within the C3 clinic pilot.

### Virtual Previsit Consultation

During the pilot period, our general internal medicine team estimated that they spent an average of 14 minutes preparing for their virtual previsit consultation with patients, 25 minutes on the virtual previsit call, and 12 minutes completing postvisit documentation and order placement for the patients on-site visits. These physicians ranked the value of these virtual previsit consultations at 6 on a 10-point scale (range, 5 to 10) across all patients. Our gastroenterology specialists joined the virtual previsit consultation after initial intake with a general internal medicine physician and reported an average of 22 minutes preparing for the virtual previsit consultation with the patient, 17 minutes on the video call with the patient and general internal medicine physician, and 10 minutes completing documentation and order placement for the patient on-site visits. Our gastroenterology specialists indicated high value in the virtual


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**TABLE 3. Impact Assessment of the Complex Care Coordination Clinic Pilot**

| Variable | C3 pilot patients (n=34) | Comparison cohort (n=95) | Total (N=129) | *P* value |
|---|---|---|---|---|
| Added appointments/imaging/procedures | | | | .18 |
| Mean ± SD | 13.9±7.8 | 12.4±8.7 | 12.8±8.4 | |
| Median | 15.0 | 11.0 | 12.0 | |
| Q1, Q3 | 8.0, 17.0 | 6.0, 16.0 | 6.0, 17.0 | |
| Range | 1.0-33.0 | 0.0-43.0 | 0.0-43.0 | |
| Added or cancelled appointments/imaging/procedures | | | | .33 |
| Mean ± SD | 19.9±11.9 | 18.0±12.0 | 18.5±12.0 | |
| Median | 21.0 | 15.0 | 17.0 | |
| Q1, Q3 | 11.0, 24.0 | 8.0, 25.0 | 9.0, 25.0 | |
| Range | 1.0-56.0 | 0.0-65.0 | 0.0-65.0 | |
| Days on campus | | | | .0005 |
| Mean ± SD | 7.0±2.5 | 5.2±2.4 | 5.7±2.6 | |
| Median | 7.0 | 5.0 | 5.0 | |
| Q1, Q3 | 5.0, 8.0 | 3.0, 7.0 | 4.0, 7.0 | |
| Range | 1.0-15.0 | 1.0-12.0 | 1.0-15.0 | |
| Message: patient medical advice request | | | | .06 |
| Mean ± SD | 11.6±10.6 | 8.0±9.7 | 9.0±10.1 | |
| Median | 9.0 | 5.0 | 6.0 | |
| Q1, Q3 | 2.0, 18.0 | 0.0, 11.0 | 0.0, 14.0 | |
| Range | 0.0-33.0 | 0.0-45.0 | 0.0-45.0 | |
| Message: patient schedule request | | | | .23 |
| Mean ± SD | 0.3±1.0 | 0.5±1.4 | 0.5±1.3 | |
| Median | 0.0 | 0.0 | 0.0 | |
| Q1, Q3 | 0.0, 0.0 | 0.0, 1.0 | 0.0, 0.0 | |
| Range | 0.0-5.0 | 0.0-11.0 | 0.0-11.0 | |
| Message: patient calls | | | | .15 |
| Mean ± SD | 2.8±2.9 | 2.7±5.0 | 2.7±4.5 | |
| Median | 2.0 | 1.0 | 1.0 | |
| Q1, Q3 | 0.0, 5.0 | 0.0, 3.0 | 0.0, 3.0 | |
| Range | 0.0-10.0 | 0.0-38.0 | 0.0-38.0 | |

C3, complex care coordination; Q1, first quartile; Q3, third quartile.

previsit consultation with patients, with an average rank of 9 on a 10-point scale for perceived value (range, 7 to 10). Our general internal medicine physicians and gastroenterology specialists indicated a high degree of agreement in evaluating the appropriateness of each C3 clinic pilot patient between patient need and fit for the C3 clinic intent (general internal medicine average score of 6 [range, 2-10] and gastroenterologist average score of 6 [range, 2 to 10]).

Qualitatively, physicians indicated that they made changes to patient planned visits, such as "I cancelled liver clinic, added tests and studies - a very different plan than what was previously scheduled." Physicians noted the ability to shift a patient from a planned visit to the C3 clinic to another care area when they discovered additional information when speaking with the patient: "While talking I was able to walk through [the medical record] with the patient and noticed some abnormal lab values. Based on this I ordered hematology, cardiology, and endo [endocrinology] [appointments] whereas the patient had been [scheduled for only a pulmonary visit] initially. I don't think that this patient is good for C3; there is something else going on." Patients provided the following feedback regarding their virtual previsit consultation as part of the C3 clinic: "The video call was a very important interaction. I was able to tell my story and the doctors were able to start thinking about my symptoms and understand

how widespread they were" and "I had a video call with the two doctors and thought it was good for planning when I'm in town — which is important as I am out of state."

### On-site Patient Visit

In the C3 clinic pilot, we saw 34 patients who we were able to compare with 95 similar patients within our comparison cohort (Table 2). Median age was lower in the C3 clinic patients (36.5 years) compared with our comparison cohort (47.0 years; $P$=.07). There was a higher proportion of females in the C3 clinic cohort (30 of 34 [88.2%]) than in our comparison cohort of similar patients (68 of 95 [71.6%]; $P$=.05).

In Table 3, we present differences in outcomes for the C3 clinic patients compared with our comparison cohort. The total number of on-campus days from first face-to-face consultation to 31 days of follow-up was significantly higher among the C3 clinic cohort (mean, 7.0 days) compared with the comparison cohort (mean, 5.2 days; $P$=.0005). We did not observe significant differences in the number of added appointments/imaging/procedures ($P$=.18), total added and cancelled appointments/imaging/procedures ($P$=.33), or messages received from patients via the electronic patient portal (medical advice, $P$=.06; schedule request, $P$=.23).

Qualitatively, physicians shared that because of the virtual previsit consultation with the patient, "I had a head start into the back story and was able to dive deeper into questions I may not have gotten to if I had to start from scratch" and "I had taken the histories and done documentation during the previsit consult, so the on-campus visit was shorter and documentation was more efficient." Patients shared that "When I came here, I felt prepared and Mayo was prepared as I had 2 weeks full of appointments and tests."

Not all C3 clinic pilot patients had a smooth on-site visit sequence, as physicians continued to learn more about patients when they arrived: "The video provided very different information than in-person appointment. The patient had an ovarian tumor history that wasn't clear, she didn't plan to stay for all of the additional evaluations." Additionally, since the influence of our pilot was contained within the general internal medical and gastroenterology specialty practices, downstream and other nonaffiliated practice area procedures remained unimpacted, at times resulting in delays in scheduling and unanticipated added and cancelled consultations. For example, one C3 clinic pilot patient was registered for an 8-week program in a different department, and because of scheduling conflicts, the patient needed to cancel this program, which was dissatisfying to both the patient and the care team: "there was no satisfying end." Coordination of the on-site visit and patient itinerary continues to require substantial effort.

### Educational Programming

All patients seen in the C3 clinic were offered spots in a 4-hour, nurse educator—led interactive session and provided a link to a GSH intervention[29] hosted online. Although we experienced technical difficulties early in our clinic pilot, we were able to evolve our scheduling and contact processes with pilot patients to better meet the needs of patients and our care team. During our clinic pilot period, our nurse educators reported that "there were some logistical challenges with the technology and scheduling but these will be ironed out in future sessions" and "as we do more of these we will be able to refine the modules and how we present the information to patients virtually." Patients who participated in the combination nurse educator—led and digital education program provided positive feedback about their experience: "I loved the online classes. At first I thought 3-4 hours would be too long but [the nurse education staff] were so interesting - it was very enjoyable." Another patient commented on the content of the program: "I liked how the content explained where the pain is coming from and how my body is responding to it. [This helped] me understand how to manage pain through meditation and exercise and how to fit it into my day."

## DISCUSSION

The diagnosis and management of CSS is challenging because symptoms are often vague and involve multiple organ groups and treatment requires comprehensive care plans. Within our consultative medicine practice, we had


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identified that the needs of patients with CSS and clinicians caring for them were not being met. To address these needs, we developed the multidisciplinary C3 clinic to create a care pathway for patients with CSS and abdominal pain using both traditional and novel approaches. In the C3 clinic, we combined previsit video visits, traditional face-to-face appointments, and novel technology-based educational approaches to streamline the care and treatment for this patient population.

The previsit multispecialty virtual encounter was one of the primary innovations of the C3 clinic pilot. Video telemedicine visits have been part of our practice for some time; previous use was primarily for discussion of results and care plans with patients at the end of a multispecialty evaluation. The use of telemedicine technology in the C3 clinic pilot was novel to our practice in 2 ways: (1) previsit videoconferencing and (2) synchronous participation of multiple clinicians. The C3 clinic pilot brought the patient, the consultative medicine physician, and the gastroenterologist together in a virtual videoconference to gather pertinent history for itinerary planning, to set patient expectations, to direct the collection of specific medical records, and to streamline care at the face-to-face visit.

The previsit virtual encounter also created intangible value by building patient-clinician connections prior to arriving on site. Subsequent face-to-face interactions were streamlined, facilitating summaries of the video visit, updating any interim history, and proceeding to the physical examination and visit planning. Specialist face-to-face time was also optimized by having the requisite imaging and tests completed beforehand, allowing for a more focused discussion on results and management. However, coordinating the schedules of multiple clinicians to be present on a single video previsit presented several logistical challenges. Technical issues or prior appointment delays occasionally delayed the start of visits. Allotted time was sometimes insufficient to adequately explore the depth of patient concerns and previous testing or to answer "at-the-virtual-doorknob" questions. These limitations affected both patient and clinician satisfaction, but overall, both felt the video previsit added value to the patient's care.

A second innovation from the C3 clinic pilot was the CSS-focused online educational self-management material. For patients with FM, patient education has been associated with substantial improvement in disease perceptions and reductions in catastrophizing, pain intensity, and anxiety.[30] Among patients with IBS, GSH interventions have been associated with decreases in symptom severity and increases in quality of life.[29] Our GSH intervention was developed by our clinical experts in CSS and chronic abdominal pain and translated our contemporary understanding of these conditions. The pilot allowed us to capture feedback from patients to improve and clarify module content to enhance understanding. Future work in this area will expand the number of CSS conditions addressed with the ability to electronically order and deploy them through our electronic health record.

Two key innovations in the C3 clinic pilot improved patient care and both patient and clinician satisfaction. Video previsits provided the opportunity to preemptively address patient concerns, improve scheduling efficiency, and introduce concepts of CS. The online educational and self-management content helped patients return home with a better understanding of CSS and its implications and how to manage their symptoms and improve quality of life.

## CONCLUSION

The C3 clinic model provides a framework for physicians to help patients with debilitating CSS conditions. The C3 model utilizes virtual care to enhance the face-to-face visit through previsit video interactions and postvisit CSS-focused online educational self-management material. Our experience with the C3 model will help guide our expansion of virtual care delivery models.

Abbreviations and Acronyms: **C3**, complex care coordination; **CS**, central sensitization; **CSS**, central sensitization syndrome; **FM**, fibromyalgia; **GSH**, guided self-help; **IBS**, irritable bowel syndrome

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