

# OFPP

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FAMILY PHYSICIANS

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### **APRIL 4–7, 2024**

ACOFP 61st Annual  
Convention & Scientific  
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New Orleans, Louisiana

### **APRIL 17–19, 2024**

AACOM Annual Conference  
Kansas City, MO

### **APRIL 18–21, 2024**

Oklahoma ACOFP at OOA  
Oklahoma City, OK

### **APRIL 19, 2024**

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Scottsdale, AZ

### **MAY 4–8, 2024**

STFM  
Los Angeles, CA

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# EDITOR'S MESSAGE

## 2023: A Memorable Year, an Artistic Outlook

Paula Gregory, DO, MBA, FACOFP

Osteopathic medicine is recognized for training and parity with other medical fields that treat and take care of patients. And osteopathic medical schools continue to graduate accomplished physicians who use all aspects of their training to carefully consider the needs of their patients to treat them holistically.

In 2023, osteopathic medical students found graduate medical education homes in places sophisticated enough to recognize knowledgeable graduates with attributes that make a solid resident physician. Advocates for the osteopathic students' GME placements were impactful on federal and state levels. Accomplished faculty, staff, and leaders of osteopathic medical schools continue to teach all they've learned and, in this way, contribute to the profession.

As we reflect on those who've contributed to, and made a difference in, our educations, helping to create and shape our nuanced understanding of medicine, we have many to thank. One group who has contributed much to medical education is artists. Some physicians, in fact, are artists who branched out and used visual arts in ways both to depict and explain human anatomy. Take Dr. Alexander Gross, for instance: he was a surgeon whose artistic descriptions of surgical anatomy assisted physician education. And then there was Dr. Frank Netter, a surgeon whose anatomical illustrations can be found on nearly every medical student's PC to this very day. Considering the challenges from Leonardo DaVinci's time, where deep examination of the human body was not performed how it is today, DaVinci gave us comparative structures using a mix of human and animal anatomy, which were richly educational.

Throughout time, artists have helped medical students understand and appreciate the human body. Without art—without illustrations—a deeper understanding of the muscles, nerves, vessels, and other structures would not have been possible. Artists' power of observation helps them enhance and illuminate details that are difficult to notice when simply examining a patient.

Beyond what art can do to help us understand anatomy, it can also help us process emotions. Art fosters self-expression and can guide us to envisioning a hopeful future through positive imagery. Experiencing art through positive images helps students improve focus and transports us to a world beyond our imaginations. Art can raise serotonin levels, which helps with illnesses such as depression, and can lower cortisol levels with positive visual experiences, which can assist with healing after traumatic events.

Art is also used to help those with neurodegenerative diseases to stimulate pathways. Visual creativity can heal, treat stress, and rewire the brain. Studies show that artists aid in human creativity, and participate in modern neuroscience and neuroimaging by the sheer practice of observation. Pathways for specific functional organization of the brain are delineated. Neural circuits are malleable. The brain is capable of making new connections, activating new pathways, and unmasking secondary roads. Studies show that working with visual art can change neurotransmitter levels and stimulate the brain.

Additionally, the artist aids in understanding differences in cultures and families by showing us the very essence of life. We see depictions of pastoral scenes, families gathered, and communities at work. These are transmitted to us through painted scenes of real people—a visual history and an understanding of the culture that others experience. Without art there would be a lack of understanding of both the most simple and complex ideas.

Understanding the human body has been deeply enriched by our artists and we owe a great deal to their work and vision.

## FROM THE PRESIDENT'S DESK



### A Year of Legacy Milestones

David J. Park, DO, FAAFP, FACOFF *dist.*

As we approach the end of my term as ACOFP president, I'm proud of what we've accomplished and how our organization is poised to excel in the future. My presidential theme of Legacy and our focus on: (1) increasing engagement among our members, (2) increasing collaborations with other organizations, and (3) increasing the membership of our organization have yielded some impressive results.

The engagement and involvement of ACOFP members is the cornerstone of our growth and success. We launched new tools to encourage active engagement, including a new mobile app called **ACOFF 365**. Please download and use it! On a personal level, I visited 18 state society and student chapter meetings during this past year, fostering connections and gaining valuable insights through individual interactions. Together with other board members, we made over 28 of these visits in 2023-2024 to engage our members and we are excited about bridging these connections well into the future.

Our external collaborations have been a particular point of strength this year. We launched the Corporate Council Roundtable program, which yielded exceptional results and strengthened our ties to eight health industry corporate partners, providing mutual benefits to them and to our membership. This initiative has not only expanded our impact but has paved the way for positive partnerships that will continue to benefit the ACOFP community. I am proud of our grant efforts reaching new heights, with several collaborative grants and the massive Risk Evaluation and Mitigation Strategies (REMS) grant for opioid education. The REMS grant was our largest grant ever and will produce free educational opportunities for thousands of family physicians. Educational partnerships with several other associations resulted in a wealth of new learning opportunities for the ACOFP community and beyond.

We are growing and I am inspired for our future! Our membership organization grew to over 26,000 members strong, an increase of over a thousand members since this time last year. This is a testament to the value and impact ACOFP has for our members and propels us to achieve our vision of being the professional home of osteopathic family medicine for the nation. I can't thank each of our members enough for their growing support and engagement, which is the foundation of our success as an organization.

As we look ahead to the ACOFP '24 annual convention, scheduled from April 3rd to 7th in New Orleans and also taking place virtually, there is much to anticipate. This event is poised to be an unforgettable experience. Those attending in person will have the chance to engage with everything New Orleans has to offer, from its rich culinary scene to its vibrant music culture. This conference will provide a unique blend of learning and networking opportunities that will further empower and connect our family of brilliant physicians and students. I am anticipating a record-breaking attendance of students!

The engageOne innovative initiative during the conference will be the Think Tank on April 6th and 7th. This event will convene 100 practicing physicians and students to identify innovative ways to promote family medicine as an appealing and satisfying profession for osteopathic medical students as we continue the impactful work of the ABFM Futures grant. Another exciting event is the Best Of Osteopathic Manipulation Mentors (BOOMM!), a small group event that will teach our students real-world applicable techniques and demonstrate the power of our osteopathically trained hands.

As I conclude my term, I want to express my sincere appreciation to each member of the ACOFP community for their dedication, collaboration, and unwavering support. Together we have achieved great milestones, and I am confident that the legacy of our accomplishments will resonate for years to come. Thank you for the privilege of serving as your president, and I look forward to witnessing the continued success of ACOFP in the future.

Professionally Yours,

David J. Park, DO, FAAFP, FACOFF *dist.*  
2023-24 ACOFP President



Scan to watch  
*I Am Legacy* video

## PAST PRESIDENTS SPOTLIGHT

### Paul A. Martin, DO, FACOFP *dist.*

**TERM OF PRESIDENCY:** 2012-2013

**THEME OF PRESIDENCY:** Innovation

**ACCOMPLISHMENTS:**

- Upgraded ACOFP informational technology capabilities to produce 16 webinars. Additionally, the In-Service Examinations (ISE) for residents moved from a written format to electronic.
- "I was in Washington, DC, at least every 2 months advocating for sustainable growth rate (SGR) reform and equitable physician reimbursement, especially for cognitive family physician clinical work. There was very limited space in the Washington office, and as a result, I had to displace an employee from their desk to utilize their computer and phone. Consequently, plans for a National Osteopathic Advocacy Center (NOAC) were drafted with a visiting physician's office and large space for meetings and committee work. The NOAC project was in part funded by ACOFP and many ACOFP members."
- The idea of a single accreditation system (SAS) for osteopathic and allopathic residencies was brought forth informally to ACOFP leadership during OMED 2012. ACOFP leadership proposed a Memorandum of Understanding, which included the American Osteopathic Association (AOA) and Accreditation Council for graduate medical Education (ACGME) on a SAS. From that point, the SAS for residencies evolved over 5 years, to where it is today.



### Kieran P. Knapp, DO, FACOFP *dist.*

**TERM OF PRESIDENCY:** 2002-2003

**THEME OF PRESIDENCY:** Common sense

**ACCOMPLISHMENTS:**

- Established the liaison with the American Academy of Family Physicians (AAFP) through meetings with Dr. Pugno, and participated as first ACOFP and American Osteopathic Association (AOA) representative at their Future of Primary Care Summit.
- Assigned a task force that completed the standards for the rural care residency program.
- Began and established the Center for Procedural Medicine.



THIS NEW FEATURE HIGHLIGHTS THE LEGACY OF ACOFP PAST PRESIDENTS.

### Glenn G. Miller, DO, FACOFP

**TERM OF PRESIDENCY:** 2005-2006

**THEME OF PRESIDENCY:** Our country was in a malpractice insurance crisis and we had to address it.

**ACCOMPLISHMENTS:**

- Accomplishments are made by a team, not an individual. I am extremely grateful to have had an excellent board who helped in every way.
- Malpractice was a tremendous problem for all doctors. I reached out to the American Academy of Family Physicians (AAFP), who invited me to address their convention on this and other issues. The response was positive, and working together, we were able to make significant improvements.
  - One problem with reimbursement for family doctors was that insurance payments were weighted more on procedures than on cognitive visits. With the tremendous help of Dr. Tom Told, we began workshops at the convention to train our members to perform in-office procedures.
  - As our osteopathic medical schools grew in number, we knew that there would be a need for additional residency positions. During that year, we had a significant increase in residency slots.



## REVIEW ARTICLE

# CHRONIC LIMB-THREATENING ISCHEMIA: MANAGEMENT UPDATES AND COMMON QUESTIONS

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## KEYWORDS

Chronic limb-threatening ischemia

Peripheral arterial disease

Peripheral vascular disease

## ABSTRACT

Chronic limb-threatening ischemia (CLTI) is an advanced form of peripheral vascular disease with high rates of morbidity and mortality. Patients often present with claudication, impaired walking, and ischemic pain. Screening for CLTI and peripheral arterial disease is recommended with ankle-brachial indexing. To prevent progression to CLTI, family medicine physicians can intervene with lifestyle modification of hyperlipidemia, obesity, smoking, and encouraging well-rounded high-fiber diets. OMT can be useful in increasing lower-extremity circulation and collateral-vessel development. If refractory to optimized medical management and lifestyle modification, surgical intervention is required. Regardless of intervention, CLTI maintains a high rate of morbidity and mortality, with halting progression being the primary objective.

## INTRODUCTION

Peripheral arterial disease (PAD) is a manifestation of systemic atherosclerosis affecting >230 million people worldwide.<sup>1</sup> PAD is a disease in which patients have plaque disturbances in their arteries that can cause blockages, be asymptomatic, cause claudication, or in 11% of cases, progress to chronic limb-threatening ischemia (CLTI).<sup>2</sup> Risk factors for PAD include hyperlipidemia, hypertension, and diabetes, as well as modifiable lifestyle risk factors such as smoking, poor diet, obesity, and lack of physical activity.<sup>1</sup> Lower-extremity PAD symptoms may include intermittent claudication, which is defined by cramping, fatigue, or discomfort in the calf muscles brought on by physical activity and relieved with rest. Many patients with PAD may not experience these classic symptoms<sup>3</sup>; as such, other symptoms should be investigated in patient history such as impaired walking function and ischemic pain at rest, as these could be indicative of more advanced disease.<sup>4</sup> Diagnosis and classification of PAD are recommended via noninvasive ankle-brachial index (ABI) testing.<sup>4</sup>

Those in the asymptomatic and claudication categories of PAD should first be treated with risk-factor modification and claudication medical therapy including exercise.<sup>5</sup> Invasive procedures in the asymptomatic and claudicant stages can complicate the disease and cause progression. Caution should be exercised in intervening in a patient who has PAD in the claudicant stage.<sup>6</sup>

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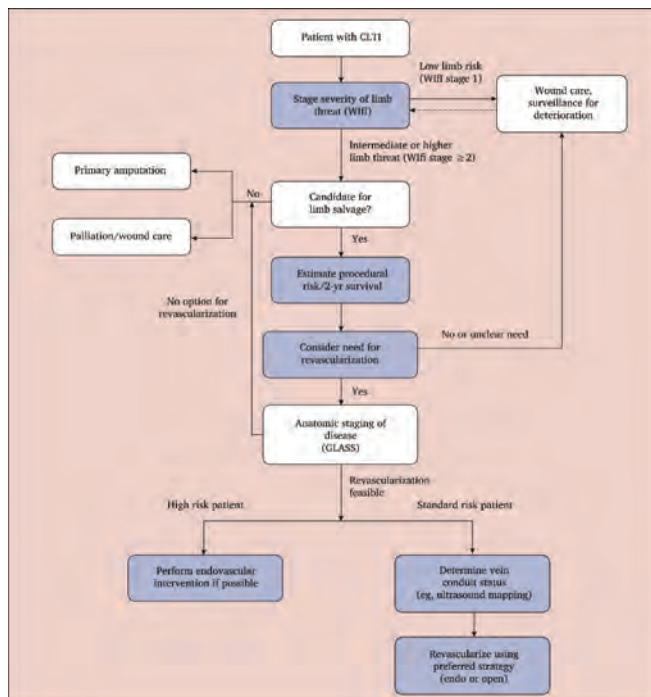
Once PAD progresses to CLTI, vascular surgeons or other qualified specialists can intervene with revascularization techniques, open bypass, minimally invasive methods, amputation, or palliative care.<sup>7</sup>

Chronic limb-threatening ischemia (CLTI), by definition, is PAD in addition to rest pain, gangrene, or a lower-limb ulceration greater than 2 weeks' duration.<sup>7</sup> Identifying patients with CLTI is important because early intervention can affect quality of life, need for amputation, mortality, and prevention. The 2020 Global Vascular Guidelines aim to improve treatment decisions for patients with CLTI.<sup>6</sup> The previous model for treating CLTI was based purely on ischemia due to atherosclerosis.<sup>8</sup> It is important to note that only those with CLTI, not those who are asymptomatic or have claudication, are classified in this algorithm.

A multimodality approach including preventative medical therapy, appropriate physical exam, objective testing, and CLTI classification determines surgical treatment (Figure 1). Surgical treatment for CLTI includes a possible endovascular approach or open bypass repair. Recently, the BASIL2<sup>9</sup> and BEST-CLTI<sup>10</sup> studies reported differing best surgical approaches to CLTI: one study reported bypass as most favorable; the other indicated an endovascular-first approach. In addition, palliative care can be offered. The criteria to determine best therapy are largely based on staging using the Wound, Ischemia, and foot infection (WIFI) clinical stage.<sup>11</sup>

FIGURE 1:

Decision making for CLTI treatment<sup>7</sup>



**Classification**

While surgical treatment for CLTI continues to evolve and is determined by the vascular surgeon, this new system of classification, similar to TNM [tumor, node, metastasis] can be helpful in guiding the family practitioner in relaying the severity of disease and risk for amputation.<sup>7</sup> In addition, earlier referral and medical management are prudent for limb salvage, once the diagnosis of CLTI is suspected.<sup>12</sup> In 2014, the Society for Vascular Surgery proposed the Wifi classification system. This system is used to determine methodology of treatment and also need for revascularization, as well as for identifying those who are not eligible for revascularization.<sup>11</sup> The wound is classified according to size, depth, and severity. Ischemia is scored based on ABI, along with toe-pressure indices. The last criterion measured is the extent of foot infection based on perfusion, extent, depth, infection, and sensation (PEDIS), as well as Infectious Diseases Society of America (IDSA) diabetic foot classification systems.<sup>13</sup> Based on the scores, a stage is defined as 1-4, with a risk of amputation assigned and a revascularization benefit score.<sup>11</sup> Amputation risk increases with severity of infection, ischemia, and wound, rather than solely on the level of atherosclerotic disease.

**History Taking**

To appropriately manage patients with signs and symptoms of CLTI, a thorough history should be taken. Risk factors should be assessed and treated appropriately, including conditions such as hyperlipidemia, hypertension, diabetes, coronary artery disease, and chronic kidney disease. History also includes lifestyle risk factors such as smoking and physical inactivity. Lack of treatment for these factors increases mortality rates and risk for a cardiovascular event.

**Physical Exam and Testing**

Vascular examination for PAD should include palpation of pulses, auscultation for bruits, and inspection of the legs and feet. Lower-extremity pulses are assessed and rated as follows: 0, absent; 1, diminished; 2, normal; or 3, bounding. Physical exam findings suggestive of PAD include abnormal pulses, vascular bruits, nonhealing wounds, gangrene, and elevation pallor/dependent rubor.<sup>4</sup> The distinction between CLTI and other forms of PAD on physical exam is the extent of pain or tissue loss, among other identifiable factors including length of onset. What distinguishes CLTI from other forms of PAD are nonhealing wounds, gangrene, and rest pain. Once a patient is identified as having CLTI, they are staged to determine which treatment is best.

Based on outcomes for staging CLTI, it is important to delineate on physical exam neuropathy, wound characteristics, evidence of infection, and vascular pulse exam. Ordering both ABIs and toe-pressures for high-risk patients is indicated. The reasoning for toe-pressure indices in addition to ABIs is that patients with diabetes mellitus or end-stage renal disease may have falsely elevated ABIs, and disease is better identified with toe pressures.<sup>14</sup> Toe pressures <30 mmHg and ABIs <0.4 are indicative of severe disease.<sup>11</sup>

For patients with diabetes, additional examination for loss of vibration with a tuning fork should be performed, as they are at higher risk for tissue loss, even if asymptomatic.<sup>15</sup> Attention to hair loss, muscle atrophy, cap refill time, and temperature of skin are also important.

**Lifestyle Modifications**

Modification of risk factors should be included in the treatment plan for all patients with PAD and CLTI, as a healthy lifestyle has been associated with risk reduction among these patient groups.<sup>16</sup> Diets high in fiber have been associated with reduced risk from PAD.<sup>17</sup> In patients with symptomatic PAD, smoking cessation can reduce the risk of CLTI, amputation, and death.<sup>1</sup> Exercise therapy can be a highly effective way to improve function in patients with PAD.<sup>1</sup>

**Medical Management**

Medical management can include antiplatelet agents, lipid-lowering agents, antihypertensives, glucose control, and lifestyle modifications. The goal of medical management is to protect the limb but also to prevent cardiovascular and neurovascular complications. Rivaroxaban has shown to lower incidence of acute limb ischemia, major amputation for vascular causes, myocardial infarction, ischemic stroke, or death from cardiovascular causes than aspirin alone.<sup>17</sup> In addition, ticlopidine, dipyridamole, and clopidogrel, may be more effective than aspirin.<sup>7</sup> There is level 1 evidence that a statin should be included in the treatment plan as a lipid-lowering agent. PCSK9 inhibitors such as evolocumab have also shown promise.<sup>18</sup> Glucose control with metformin as a first-line agent is recommended. Additional agents can be added. Sodium-glucose co-transporter 2 (SGLT-2) inhibitors for glucose control should be used with caution due to their unknown effect

on limb salvage. (Though the black box warning for canagliflozin has been lifted).<sup>19</sup>

## Osteopathic Management

OMT is a noninvasive preventative intervention that enhances the body's natural healing mechanisms, such as promoting lymphatic drainage and increasing vascular perfusion.<sup>20</sup> Blood-flow dynamics is a potential determining factor in PAD, vascular claudication, and CLTI. Blood circulation in fascial tissue has been noted to be critical in maintaining biomechanical and nociceptive homeostasis.<sup>21</sup> A randomized controlled trial by Brandl et al. investigated the immediate effects of myofascial release treatment on lumbar microcirculation. Using ultrasound to measure blood flow, they noted an increase of 31.6% in blood flow in their experimental patients vs a vast decrease in blood flow in the placebo group.<sup>21</sup> A similar study by O-Yurvati et al. noted a decrease in central volume and improvement in peripheral circulation following postoperative OMT in patients who had undergone coronary artery bypass graft surgery (CABG).<sup>22</sup> Of note, a study by Lombardini et al. examined endothelial function in 15 participants with intermediate claudication receiving OMT vs 15 intermediate claudication patients matched for age, sex, and medical treatment. They discerned that the OMT group had increased brachial-flow-mediated vasodilation, and ABI, which were consistent in decreased claudication from the beginning of the study till the end.<sup>23</sup> Although OMT has been widely described for its use in musculoskeletal pain, its approach has also been noted to restore autonomic tone and physiologic function, as well as improve blood circulation and immune response.<sup>24</sup> These findings suggest OMT is a safe and viable adjunct for pharmaceutical and surgical therapies in the treatment of PAD.

## Surgical Management/Technique

The BEST-CLI trial determined that bypass was superior for those patients with CLTI who had an adequate saphenous.<sup>25</sup> In bypass surgery below the inguinal ligament, an incision is made from a point of adequate blood supply to a point past the blockage to another vessel with adequate outflow.

To access the femoral artery, which many times has adequate inflow, an incision is made at the level of the groin to dissect out the femoral artery, or sometimes at the level of the popliteal artery. A tunneler is then used to create a passage for the saphenous vein bypass. Finally, an incision is made distally at a vessel that then has continuous flow to the foot: popliteal artery, peroneal artery, anterior tibial artery, posterior tibial artery, or dorsalis pedis artery.

A tunneler to pass the bypass conduit is used from the distal area of anastomosis to the proximal vessel. In this case, an above-knee bypass graft to the femoral region is being performed to bypass a blockage between the two points. The above-knee popliteal is the site of the distal anastomosis. More distal areas can also be the site of an anastomosis including below the knee, on the area above the medial malleolus to reach the posterior tibial artery, and on the lateral aspect of the lower limb. An area on the anterior

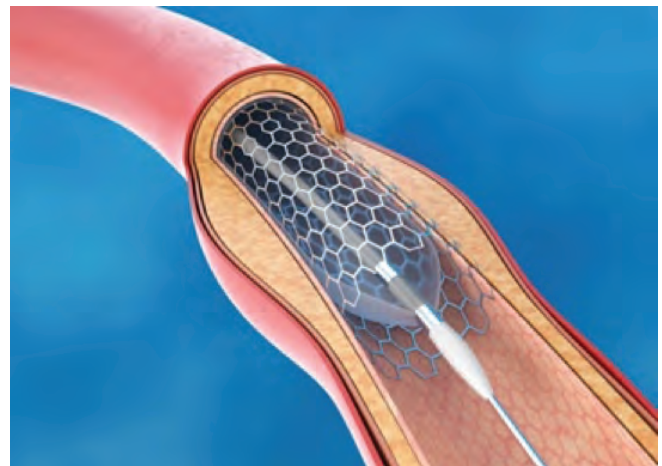
aspect of the distal leg would allow for a bypass to the anterior tibial artery. The peroneal artery can be reached with an incision medially or laterally on the lower aspect of the leg.

Other therapies well known for treatment of CLTI are endovascular methods (Figure 2). The BASIL2 trial concluded that the best endovascular treatment first revascularization strategy had better amputation-free survival over open surgeries.<sup>9</sup>

## Implications

FIGURE 2:

Endo-occlusion repair



Regardless of intervention, the 5-year outcome for CLTI is poor. Approximately half of the patients enrolled in the BASIL trial had died by 5 years after randomization.<sup>9</sup> As noted in the BASIL trial, this disease develops over many years. In this trial, around 20% of patients noted they were still smoking, 70% had diabetes, and 90% had extensive tissue loss.<sup>9</sup> Regardless of the interventions for CLTI, prevention with lifestyle interventions and timely referral by primary care are opportunities to prevent future morbidity and mortality.

## CONCLUSION

Regardless of intervention, morbidity and mortality for CLTI is poor. Halting disease progression through lifestyle intervention should be the primary goal of the family practice physician. Osteopathic manipulative medicine could be used as a potential adjunctive treatment modality to encourage circulation and collateral vessel growth. Optimized medical management with antiplatelet agents, lipid-lowering agents, antihypertensives, and glucose control can assist in slowing disease progression. Once a diagnosis of CLTI is made, vascular surgery should be consulted and preparations for bypass surgery made.

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## REVIEW ARTICLE

# ADDRESSING INFERTILITY AND OTHER REPRODUCTIVE OUTCOMES AMONG FEMALE PHYSICIANS

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## KEYWORDS

Infertility  
Female physicians  
Reproductive outcomes  
COVID-19  
Mental health

## ABSTRACT

Infertility affects one in four female physicians in the United States, yet the topic of fertility among female physicians is understudied and warrants focused strategies to implement change. Factors that exacerbate the rates of infertility in female physicians include intentional delays in family planning that are driven by the length of medical training and career advancements, age, long working hours, and physician burnout. While the effects of COVID-19 on reproductive health remain uncertain, the virus may have played a role in illuminating an already existing issue in women's reproductive health. Burnout rates among female physicians have reached record highs contributing to reproductive disorders that warrant well-deserved attention to this issue. Initiatives should focus on fertility education in undergraduate medical education, organizational-level interventions, better insurance coverage for infertility treatments, and addressing burnout. Collaborative efforts between individuals, institutions, and organizations are needed to prioritize reproductive health among female physicians.

## INTRODUCTION

Infertility is estimated to affect one in five women aged 15-49 years in the United States<sup>1</sup> and one in four female physicians within this population.<sup>2,3</sup> Infertility is defined as the inability to conceive after unprotected intercourse or therapeutic insemination for 12 months in women <35 years old, and 6 months in women >35 years old.<sup>4</sup> This definition however may not fully encompass the complex interactions that affect fertility. Infertility goes beyond just the physical and biologic aspects of reproduction. It is important to recognize the impact of multiple interconnected factors including lifestyle, stress, and emotional well-being on reproductive health.

Risk factors for infertility include age over 35 years, stress, metabolic syndrome, eating disorders, substance abuse, and sexually transmitted diseases.<sup>4</sup> For female physicians, these risk factors are further compounded by unique challenges, which are largely understudied. This includes lengthy timelines of medical education, delayed family planning, exposure risks in the workplace, and physician burnout. Infertility implicates both physical and mental wellness. Emotional distress, the toll of therapeutic/assisted reproductive technology, financial burdens,

and social stigmatization influence overall well-being. It is crucial to emphasize the mind-body connection and the importance of supporting mental health during the journey to parenthood.

Overall, the discussion of fertility among female physicians is stunted. This review addresses current outcomes, focused risk factors, barriers to fertility, mental health considerations, and future outlooks for reproductive health among female physicians. By acknowledging the interconnectedness of physical, emotional, and environmental factors, we can better understand the challenges faced by female physicians and implement focused strategies for a necessary change.

## CURRENT OUTLOOKS

Infertility among female physicians is greater than the general population in the United States. Focused literature on this topic has only recently begun to make headway, with ample room for discussion and systemic changes. A 2023 study by Lai et al. evaluated 4533 female physicians and reported that 35% underwent an infertility evaluation, and 28% underwent infertility treatment.<sup>5</sup> Another 2023 study by Bakkensen et al. evaluated 1056 female physicians at various stages of training and reported that 75.6% delayed family building and 36.8% experienced infertility.<sup>6</sup> A smaller study in 2022 evaluated 262 physicians in South Carolina and reported that of the successful pregnancies (84%) among female physicians, 21% experienced difficulties with their pregnancy and 71% reported seeing a doctor about their pregnancy difficulty.<sup>2</sup> Prior to these studies, research on this topic was scant, dating back to decades prior.<sup>7,8</sup> A consistent finding among the literature however highlights a delay in family planning

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among female physicians driven by the length of their training and career advancements. Trends toward greater infertility among future cohorts of female physicians are expected given historical data.

Factors that may contribute to infertility are abundant and involve various avenues from professional pressures to natural impediments to conception. The average length of medical school and residency amounts to 8-11 years, placing physicians around the age of 32-35 years by the time they complete training, without including fellowship.<sup>9</sup> It goes without saying that the length and demands of medical training have an impact on family planning decisions. In fact, regarding measures taken to accommodate childbearing, female physicians have needed to choose a different specialty (24.8%), taken extended leaves (28.8%), passed up opportunities for career advancements (47.2%), and have left medicine entirely (4.3%).<sup>6</sup> Misconceptions about the risk of infertility, possibly owing to the lack of awareness and advocacy in medicine,<sup>5</sup> are also believed to postpone childbearing in the setting of professional advancement leading to involuntary subfecundity. Along with delayed family planning due to professional pressures and the length of training, comes advanced maternal age and diminished ovarian reserves.<sup>2</sup> As a result, in comparison to the general population, female physicians who waited to have children later in life are more likely to undergo miscarriage (40.7% vs 19.7%), infertility evaluation (35.2% vs 8.8%), and infertility treatments (28.1% vs 12.7%).<sup>5</sup>

There is a reported correlation between long working hours and infertility among women believed to be secondary to circadian dysrhythmia, poor dietary habits, burnout, and hormonal changes.<sup>10</sup> This also extends to other reproductive consequences such as menstrual cycle disorders in health care workers, which are largely understudied in recent years.<sup>11,12</sup> Physician burnout, discussed further in the Mental Health section below, has also exhibited a strong correlation to high-risk pregnancies and miscarriage.<sup>13</sup>

With retrospective reflection, a majority of female physicians report they would have attempted to conceive earlier despite career demands (28.6%), used cryopreservation (7.0%), or gone into a different specialty all together (17%).<sup>7</sup> From a fiscal standpoint, there is surging evidence on the lack of adequate infertility insurance coverage for female physicians.<sup>14</sup> This poses a serious barrier to family planning given a high debt-to-income ratio. In vitro fertilization can cost up to USD \$19,000, and after several rounds may accumulate to up to USD \$200,000.<sup>14</sup> However, most employee coverage is capped at a lifetime maximum between USD \$15,000-\$100,000.<sup>14</sup> There should be an ongoing discussion on the support and resources that may be provided in place of inadequate insurance coverage and high costs of family planning options, with the goal of enabling women to make informed decisions about their career and family-oriented goals.

## IMPACT OF COVID-19 ON FERTILITY AND OTHER REPRODUCTIVE OUTCOMES

When addressing current factors that perpetuate adversity to reproductive health, it is imperative to consider the toll that the COVID-19 pandemic has taken on health care workers. The prevalence of COVID-19 in front-line workers (2747 per 100 000) is reportedly more than 11 times greater than the general population (242 per 100 000).<sup>15</sup> At present, preliminary studies suggest there is little impact of the virus on female fertility, but there are not enough cumulative data on the link between COVID-19 and infertility among females, let alone female physicians who are at a higher risk of contracting the virus.<sup>16,17</sup> It merits discussion and focused cohort studies because, in many ways, COVID-19 plays a role in illuminating an already existing issue in reproductive health.

Female physicians reportedly experience greater rates of burnout in comparison to male physicians.<sup>13,18</sup> According to the Medscape National Physician Burnout & Suicide Report 2021, one-tenth of female respondents considered the impact of COVID-19 to be so burdensome that they considered leaving medicine altogether.<sup>18</sup> Despite this, and while the relationship between stress and infertility remains controversial,<sup>19</sup> there is a staggeringly limited amount of literature on the direct impact of COVID-19 on female fertility in comparison to male fertility. During the Spring of 2021, various medical schools offered their fourth-year medical students the option of early graduation to join the COVID-19 response.<sup>20</sup> This was to ease the burdens on overworked and understaffed hospitals. The already existing physician shortage in the United States was accelerated by the pandemic, and while early graduation may have been a strategic solution, it is unknown what degree of negative effects it had on the physical, mental, and reproductive health of the new cohort of female physicians. The work-life balance is a sustained and pressing issue among physicians and the pandemic only served to heighten it. With long working hours, lack of sleep, and quarantine measures among other new stressors of COVID-19, it may be expected that work-related stress had spilled over into a physician's personal life. Such stressors served as obvious and unavoidable impediments to those physicians who were actively family planning.

The impact of COVID-19 on other reproductive outcomes is reported but is largely unvoiced for female physicians. The virus is associated with amenorrhea, dysmenorrhea, changes in cycle length, and irregular menses likely owing to its direct impact on the expression of genes during menses coupled with pandemic-related stress.<sup>17,21</sup> There are currently no data on menstrual cycle changes among female physicians postinfection in comparison to the general population, but this would shed light on the differences in reproductive outcomes between these populations. Overall, the effects of COVID-19 on reproductive health remain scant for female physicians, perhaps owing to the recency of the virus. This issue calls for a joint effort among scientists to bring awareness to this topic through novel cohort studies that evaluate the correlation between COVID-19 and female fertility.

## MENTAL HEALTH

Burnout is defined as a response to chronic workplace stress associated with a triad of emotional exhaustion, depersonalization, and feelings of diminished accomplishment.<sup>22</sup> Burnout is classified as a medical disorder, according to the *International Classification of Diseases, 10th edition (ICD-10)*.<sup>22</sup> The physical and psychological implications of unaddressed burnout may lead to serious impacts on overall physician well-being. In a survey done by Medscape in 2021, 87% of physicians reported burnout, and while female physicians have consistently reported higher burnout rates compared to their male counterparts, it was at a record high this year (51% female, 36% male).<sup>18</sup> The lack of personal protective equipment, difficult working conditions, and grief over losing patients associated with the impacts of COVID-19 exacerbated an already depleted health care force.<sup>18</sup> The ramifications of increasing burnout rates in the workplace also seep into home and family life with foreseeable implications. In 2020, female physicians aged less than 45 years reported combining parenthood and work as the most concerning challenge in their career, followed by managing work-life balance as a close second.<sup>18</sup> While many health care providers experience burnout, the disproportionate impact on family life in female physicians remains a prevalent issue and may deter young physicians from pursuing reproductive options altogether.

The correlation between emotional burnout and the development of reproductive disorders creates a causative relationship that produces circulatory impacts. It is well established that psychological stress can have negative outcomes on reproductive efforts, however, the inability to conceive also leads to emotional distraught, creating a cyclical ongoing effect. In a recent national survey of 850 US surgeons, 42% of female surgeons reported a pregnancy loss and 75% took no time off work following the loss.<sup>23</sup> Working more than 40 hours per week and consistent night-shift work are associated with higher risks of miscarriage.<sup>24</sup> Scheduling accommodations for pregnant physicians should be considered to mitigate pregnancy losses. Although the mental health impacts associated with reproductive problems are well understood, the amplification of such impacts among female physicians remains poorly researched, nor is it advocated for appropriately.

## FUTURE OUTLOOKS

Though this review focuses on female physicians, fertility issues in all health care individuals warrant discussion. With greater infertility rates and poorer reproductive outcomes in health care personnel, it begs the question of what is being done to address this. Adverse emotional, physical, financial, and social outcomes of one's well-being merits room for attention to the topic of infertility in health care. As previously addressed, future literature in the style of focused cohort studies will shed light and bring this topic well-deserved consideration. Future studies should aim to evaluate the numerous avenues that affect fertility in health care personnel from current events, COVID-19, career pressures, and natural impediments.

The transfer of knowledge on infertility should begin in medical school. As humanities and ethics in medicine are core

components of the medical school curriculum that draw attention to essential issues in health care, incorporating a topic like this may prompt progressive discussion. Understanding the academic rigor and duration of medical education spanning over a decade, it is imperative to include medical students to participate in the conversation. The notion of delaying family planning in the setting of professional advancements should be actively discussed. Support during the rigors of residency/fellowship training in the form of positive workplace environments, professional and psychological support, and time coverage should be further explored among programs for those receiving fertility treatments. Recently, a call to action was pursued by the American Women's Association in the form of an infertility task force, which held a national physician fertility summit in 2021. This summit advocated for egg freezing, insurance coverage, mental health, and more accommodations for physicians who wish to conceive. Future initiatives of similar intent will draw the necessary focus to this topic with potential for fewer infertility outcomes in female physicians and all persons in health care.

Targeting issues at the organizational level is more efficacious than addressing them at the individual level.<sup>25</sup> The impacts of COVID-19 reached beyond the negative effects on physical health as the stress, long hours, and mental anguish began to compound, ultimately leading to widespread burnout among physicians. From a financial standpoint, the lack of infertility insurance coverage among physicians should be reconsidered. Residency programs and private institutions might consider partnerships with insurance providers that offer adequate coverage for those seeking fertility treatments. While individuals and institutions should collaborate on advocacy for mental health, ultimately accommodations for perinatal loss, grief counseling, and burnout should originate at the organizational level. Reasonable and humanistic benefits need to be pre-established for physicians pursuing family planning and undergoing infertility and reproductive issues, without fear of consequences or burdening their colleagues. Reproductive issues are unpredictable, necessitating systems that are already in place to alleviate the psychological, physical, financial, and cumulative burden of unforeseen fertility. There are numerous opportunities to address infertility and reproductive health with ample room for positive improvements for the future of health care.

## CONCLUSION

Female physicians are at greater risk of infertility than the general population due to delayed family planning, professional pressures, and medical training demands. Advocating for holistic care in reproductive health means considering the broader context in which individuals work and live. The COVID-19 pandemic illuminated an already existing issue in reproductive health calling for joint efforts to bring awareness to this topic. Female physicians experience higher rates of burnout, highlighting the need for policies at the organizational level to advocate for work-life balance and psychosocial support. There is a need for continued discussion of fertility among female physicians and focused strategies to implement change. Prioritizing this issue may enable female physicians to balance their professional, personal, and family goals.

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BRIEF REPORT

# APPLICATION OF OSTEOPATHIC TREATMENT FOR NON-PAIN-RELATED DISCOMFORTS OF PREGNANCY: A LITERATURE REVIEW

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### KEYWORDS

- Osteopathic treatment
- Pregnancy
- Edema
- Nausea
- Constipation
- Gastroesophageal reflux disease

### ABSTRACT

Many osteopathic textbooks include treatment modalities and techniques that could improve frequently experienced ailments of pregnancy, such as nausea, vomiting, gastroesophageal reflux disease, constipation, and edema. However, there is little scientific evidence to support the use of osteopathy for these conditions, particularly among the pregnant population. The aim of this literature review is to identify and evaluate current evidence regarding the use of osteopathy in the management of common discomforts of pregnancy. Several search engines and journals were used to identify peer-reviewed articles written between 2003 and 2023. Eleven articles were included in total, including a variety of case reports, pilot studies, and journal articles. The results show that although osteopathy does appear to be safe to perform during the third trimester and its efficacy in the treatment of these conditions is promising, current evidence is insufficient to guide treatment protocols. Further research is needed to establish efficacy and determine osteopathic treatment regimens.

## INTRODUCTION

Most of the research conducted to evaluate osteopathic medicine has focused on pain management. However, there are several non-pain-related ailments that many osteopathic textbooks claim could be improved with the use of osteopathy. Pregnant women frequently experience many of these ailments, including nausea, vomiting, gastroesophageal reflux disease (GERD), constipation, and edema,<sup>1</sup> and could theoretically benefit from osteopathic manipulation. The objective of this paper is to review current literature regarding the use of osteopathic manipulative medicine to alleviate common discomforts of pregnancy and provide clinical recommendations for the osteopathic physician.

## METHODS

A thorough literature review was conducted using the following search engines and journals: Google Scholar, PubMed, *Journal of the Osteopathic Family Physician*, and *Journal of Osteopathic Medicine*. A standard protocol was used to search each database, which included entering the keywords seen in Figure 1 into the search bar. Only peer-reviewed articles written between 2003 and 2023 were included. A total of 11 articles and case reports were included in this study, which included case reports, pilot studies, and journal articles.

FIGURE 1:

Keywords entered into search engines

Pregnancy	<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> <li>• vomiting</li> </ul>	<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> <li>• GERD</li> </ul>	<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> <li>• Edema</li> </ul>	Osteopathic treatment of hyperemesis gravidarum	Osteopathic treatment of gastroesophageal reflux disease
<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> </ul>	<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy,</li> <li>• hyperemesis</li> </ul>	<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> <li>• Gastroesophageal reflux disease</li> </ul>	Osteopathic treatment of nausea	Osteopathic treatment of dyspepsia	Osteopathic treatment of constipation
<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> <li>• Nausea</li> </ul>	<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> <li>• Dyspepsia</li> </ul>	<ul style="list-style-type: none"> <li>• Osteopathy</li> <li>• Pregnancy</li> <li>• Constipation</li> </ul>	Osteopathic treatment of vomiting	Osteopathic treatment of GERD	Osteopathic treatment of edema

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## RESULTS

### Edema

There were two articles identified concerning the use of osteopathic manipulation in the treatment of lower-extremity edema among pregnant women. The first study was a randomized controlled trial (RCT) that sought to evaluate hemodynamic effects of osteopathic treatment in relation to orthostatic position changes (head-up tilt testing) and intermittent calf-muscle tension (heel raising) among women in their third trimester. The researchers found no statistical difference in heart rate or blood pressure at rest or with head-up tilt testing pre- and posttreatment, but observed an acute increase in blood pressure and decrease in heart rate following heel raising among the patients who had received osteopathic manipulative treatment. Specific treatment modalities utilized during this study included soft tissue, articular, myofascial release, and muscle energy directed at the head, neck, abdominal diaphragm, pelvic diaphragm, back, pelvis, and sacrum. The researchers concluded that osteopathy may improve venous return by supporting the skeletal muscle pump and could therefore impact the incidence and/or severity of lower-extremity edema and other discomforts of pregnancy related to venous congestion.<sup>2</sup>

The second, known as the PROMOTE study, was an RCT that included 380 subjects with the primary objectives of evaluating osteopathic management of low back pain, improving functional status during the third trimester, and incidence of certain complications of pregnancy, labor, and delivery. As part of their osteopathic regimen, they included techniques theorized to improve both lower-extremity edema and constipation, although they did not measure changes associated with these conditions, as they were not the primary objective of this study. However, the researchers concluded that the osteopathic techniques performed in this study are safe during pregnancy and effectively decrease the rate of loss of functional status over the course of pregnancy.<sup>3,4</sup>

### Nausea and Vomiting

Although many osteopathic physicians have reported a decrease in nausea and vomiting among pregnant patients treated with osteopathy,<sup>5</sup> only one case report was found using the search criteria outlined above. In this case, a 27-year-old G1P0 at approximately 14 weeks' gestation was evaluated at an osteopathic clinic for severe nausea and vomiting. Although the patient did not meet the Fairweather criteria for hyperemesis gravidarum, she did show several signs and symptoms consistent with the diagnosis, including severe nausea and vomiting and 5-lb weight loss. The patient was found to have several somatic dysfunctions and was treated accordingly. Following treatment, the patient reported a decrease in nausea and vomiting of 50% and 41%, respectively, using the Pregnancy-Unique Quantification of Emesis and Nausea (PUQE) index and the Hyperemesis Impact of Symptoms Score (HISS).<sup>6</sup>

### Constipation

There were no articles identified concerning the use of osteopathic manipulation in the treatment of constipation for pregnant women, however, there were two articles identified that evaluate the use of osteopathy to treat constipation.

The first article was a pilot study that evaluated the use of osteopathic manipulative treatment for constipation in six participants. This study found a clinically and statistically significant improvement in severity of constipation, quality of life, and colonic transport time.<sup>7</sup>

The second article was also a pilot study that evaluated the use of osteopathic manipulative treatment for constipation in 21 constipated female participants. This study found that the Knowless Eccersley Scott Symptom score, oro-anal transit time, left colonic transit time, and right colonic transit time had decreased, and stool frequency and Bristol stool scale had increased. There was no significant change in patient assessment of constipation, although the patients did report a decrease in abdominal pain and bloating, with an increase in quality of life.<sup>8</sup>

### Gerd

There were no articles identified concerning the use of osteopathic manipulation in the treatment of GERD for pregnant women, however, there were six articles identified that evaluate the use of osteopathy to treat dyspepsia and GERD.

The first article is a case report that details a 37-year-old female with previously diagnosed GERD on endoscopic exam, with symptoms refractory to multiple medications. The patient was treated with OMT aimed at treating somatic dysfunctions that were identified during an osteopathic exam. The patient was also prescribed metoclopramide 2.5 mg with meals, which she discontinued after several days due to subjective lack of benefit. At a 6-month follow-up, the patient reported 90% improvement in her symptoms, which was attributed fully to the osteopathic treatment. The patient had not seen any other providers, taken any additional medications, or made any dietary changes within the 6-month follow-up period.<sup>9</sup>

The second article was an interventional study that assessed the impact of osteopathy on GERD in a total of 22 patients. Utilizing traction of the cardia, abdominal diaphragm mobilization, thoracic spine mobilization, and posture correction, it was found that the prevalence and severity of symptoms were significantly reduced 3 months after treatment, with only two patients reporting no improvement. Furthermore, this study found no statistically significant difference between patients who received osteopathic treatment only and those who received osteopathic treatment in addition to previously prescribed medications, which included H2-receptor antagonists and proton pump inhibitors.<sup>10</sup>

The third article was an RCT that sought to compare lower esophageal sphincter (LES) pressure values before and immediately after osteopathic manipulation among 38 participants. The researchers utilized a multistep diaphragm stretching technique coordinated with respiration as previously

described in the literature, with slight modifications described within their report. They found a 9%-27% increase in LES pressure shortly after osteopathic treatment, which was both clinically and statistically significant.<sup>11</sup>

The fourth article was an RCT that assessed the efficacy of osteopathy aimed at the LES for the treatment of GERD among 60 participants. The researchers performed a respiratory-based osteopathic technique previously described in the literature for the management of GERD. One week after patients received osteopathic manipulation, researchers found a 1.49-point difference in GerdQ scores between the treatment and control group, supporting the use of osteopathy for GERD.<sup>12</sup>

The fifth article was an RCT that assessed the use of osteopathy in the management of GERD among 70 patients. After performing individualized osteopathic treatment based on somatic dysfunction identified on exam, the researchers found a statistically significant change in the Quality of Life in Reflux and Dyspepsia questionnaire between the two groups, in support of the use of osteopathy. These results were sustained 20 weeks after the intervention.<sup>13</sup>

The sixth article was an interventional study performed with the intent of developing and evaluating a protocol for the osteopathic management of GERD. Using osteopathy aimed at the abdominal diaphragm and esophagus, they found an improvement from 13 out of 45 to 4 out of 45 using the QS-GERD Questionnaire in a patient with a 4-year history of GERD.<sup>14</sup>

## COMMENTS

The PROMOTE study utilized many gentle osteopathic techniques, including soft tissue, myofascial release, and muscle energy, while avoiding more aggressive techniques such as high-velocity low-amplitude. While doing so, they demonstrated the safety of osteopathic manipulation during the third trimester of pregnancy.<sup>3</sup> With this in mind, the following conclusions can be made concerning the use of osteopathy for each of the major non-pain-related discomforts of pregnancy discussed.

There is little current evidence for the use of osteopathy to treat edema in pregnancy. However, it has been demonstrated to improve venous return in conjunction with skeletal muscle pumping during pregnancy,<sup>2</sup> and has been shown to improve lymphatic flow in canines.<sup>15</sup> Given the safety profile of these techniques, it is therefore reasonable to perform osteopathic techniques to reduce lower-extremity edema during pregnancy, although further research is needed to provide treatment recommendations.

There is a single case report concerning the use of osteopathy for the treatment of nausea and vomiting among pregnant women, with no additional evidence in the literature to demonstrate a positive effect among nonpregnant patients. Osteopathy may be considered so long as the patient can tolerate treatment, but further research is needed to establish any meaningful recommendation for osteopathy to treat nausea and vomiting among pregnant patients.

The two articles concerning the use of osteopathy for the treatment of constipation conclude that osteopathy may be a legitimate treatment option. However, these articles do not evaluate pregnant patients, which may significantly alter the method of osteopathy utilized. Furthermore, the PROMOTE study utilized osteopathy that could improve constipation but did not report on outcomes related to constipation or edema, as these were not primary end measures of this study. Again, these treatments have been demonstrated to be safe, but their efficacy in pregnant patients has not yet been demonstrated. Further research is needed to evaluate the use of osteopathy to treat constipation among pregnant patients.

Of all the non-pain discomforts of pregnancy evaluated; osteopathic treatment of GERD has the most support. With six articles, including four RCTs and two interventional studies supporting the use of osteopathy for GERD, it is safe to recommend the use of osteopathy for GERD among the general population. However, there were no studies directly assessing the osteopathic treatment of GERD in the pregnant population. Although osteopathy is safe in the third trimester of pregnancy<sup>3</sup> and has been shown to be effective in the treatment of GERD, no recommendations can be made at this time. Further research is needed to evaluate the use of osteopathy to treat GERD among pregnant patients.

Many of the studies included in this review utilize similar osteopathic techniques, yet they do not follow a standardized treatment plan. Heineman proposes a treatment protocol for patients to improve gastrointestinal function, however it is nonspecific to pregnant patients. This protocol primarily utilizes gentle soft-tissue techniques, many of which have been shown to be safe during the third trimester of pregnancy by the PROMOTE<sup>3</sup> study. Within the report, Heineman includes five case reports of successful treatment with osteopathic manipulation, including cases of GERD, constipation, and nausea and vomiting.<sup>16</sup> This treatment plan should be utilized by future research to assess efficacy of these gentle techniques, particularly within pregnant women.

## CONCLUSION

There are many non-pain-related discomforts of pregnancy that could be amenable to osteopathic treatment. While there is sufficient evidence to conclude that osteopathy is safe to perform during the third trimester of pregnancy,<sup>3</sup> evidence is lacking in support of its efficacy in these conditions. There is preliminary evidence to believe that osteopathy could be efficacious for nausea and vomiting, constipation, GERD, and edema in pregnancy, but a significant amount of research is needed before strong recommendations can be made. Additional research should utilize the treatment protocol proposed by Heineman<sup>16</sup> in order to unify and strengthen future research efforts.

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## BRIEF REPORT

# HISTIOCYTIC SARCOMA: ACUTE ONSET OF WIDESPREAD NODULES AS MAIN PRESENTING SYMPTOM FOR RARE DISEASE

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## KEYWORDS

Histiocytic sarcoma

Osteopathic  
manipulative medicine

Deep vein thrombosis

Nodules

Shortness of breath

## ABSTRACT

Histiocytic sarcoma is a rare and frequently missed diagnosis. With unusual and varied presentations, it typically indicates a rapid patient decline and poor outcomes. The diagnosis requires a high degree of clinical suspicion. In this case, we explore the progression of illness in a 56-year-old white male who initially presented with a 2-week history of soft-tissue nodules scattered throughout his head, neck, torso, and limbs, as well as shortness of breath and knee pain. After a thorough workup including computed tomography imaging of the neck, chest, and lower extremity, as well as a biopsy of a nodule with immunoperoxidase staining, a diagnosis of histiocytic sarcoma was established. Due to the severity of his malignancy, his hospital course was complicated by a deep vein thrombosis. Clinicians should be mindful of the risk of acute decompensation in such cases and can employ the various tenets of osteopathic theory to improve patient quality of life. Depending on the severity of illness, physicians may proceed to facilitate end-of-life measures with grace and dignity.

## INTRODUCTION

Histiocytic sarcoma is a malignancy of histiocytes and is an infrequent finding and diagnosis.<sup>1</sup> The disease shows a slight predilection for white males but has a wide and variable age range. A classic finding for patients who present with disseminated disease is extranodal tumors. This presentation, however, has a vast differential diagnosis and can pose a challenge to health care providers. In this case, the patient presented with a rapid onset of widespread disease and was experiencing a fast decline of his overall health. Osteopathic principles and practice were not overtly carried out in the management of this case; however, in retrospect, we can appreciate what these practices could have been, and can consider their applications in future similar scenarios.

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## HISTORY, REVIEW OF SYMPTOMS, AND PHYSICAL FINDINGS

A 56-year-old Caucasian male with a medical history of chronic obstructive pulmonary disease (COPD), Chiari malformation with shunt, cellulitis and abscess, and significant tobacco use presented to the emergency department with the chief complaint of widespread nodules that had developed on his abdomen (Figure 1), all four extremities, and face in the previous 2 weeks. This was associated with new-onset shortness of breath, subjective fevers, muscle aches, lethargy, and bilateral knee pain that was worse with ambulation. Family history was significant only for hypertension and primary malignant neoplasm of the lung in the patient's father; the patient lived at home with his niece and denied any new sexual partners, recent travel, sick contacts, and unexplained weight loss. He further denied any associated pain, pruritus, bleeding, crusting, or discharge from the nodules.

At the time of admission, the patient's vitals were notable only for an elevated blood pressure of 154/90 mm Hg. On physical exam, the patient was noted to have a nodule on his upper lip that measured 5 cm in diameter; the surrounding tissue was swollen such that it caused the patient significant dysarthria. Expiratory wheezes were appreciated without the use of accessory muscles.



Multiple quarter-sized soft-tissue nodules were noted on the abdomen, on all four extremities, and especially around the knees bilaterally. No neurologic deficits were appreciated on presentation.

## INITIAL DIFFERENTIAL DIAGNOSIS AND INITIAL PLAN

The initial differential diagnosis for this patient was vast, considering the nonspecific and rapid onset of symptoms. Coccidioidomycosis, syphilis, disseminated lung malignancy, cutaneous lymphoma, and advanced HIV infection were considered, investigated, and excluded.

Initial blood tests showed aberrant red cell distribution width (14.9, high), mean platelet values (7.0, low), relative lymphocytes (8.6, low), and absolute lymphocytes (0.8, low). A complete metabolic panel was significant only for an elevated alkaline phosphatase (110). With other values within normal limits, this information was insufficient to make hard conclusions, but pointed towards the possibilities of bone or bone marrow disease, viral infection, or an autoimmune disease.<sup>2</sup>

Initial diagnostic imaging included computed tomography (CT) of the right lower extremity, of the soft tissue of the neck, and of the chest, all without contrast. These imaging modalities revealed widespread disease. The lower-extremity CT showed moderate knee effusion and diffuse soft-tissue nodules within the infrapatellar fat pad and neighboring soft tissues. The neck CT showed left-sided premandibular soft-tissue nodular lesions and projection of the upper lip with a cleft-like deformity, which gave the impression of a possible infiltrative neoplastic lesion. No evidence of airway compression was observed. The chest CT was negative for evidence of mediastinal hilar widening, pleural effusion, pneumothorax, or lymphadenopathy. It did however show 1.2-cm and 0.9-cm ground-glass nodules in the right upper lung, which suggested either a pneumonia-type disease or a pulmonary metastatic process. The CT further revealed a 2.8x2.6-cm soft-tissue nodule in the extrapleural left chest wall, which raised further concerns for metastasis. In the upper abdomen, a 1.1-cm perirenal nodule was also appreciated.

In light of these findings, hematology-oncology specialists and infectious disease specialists were consulted, and a nodule biopsy was obtained from the patient's right shoulder by interventional radiology.

## FINAL DIAGNOSIS AND INTERVENTION WITH OSTEOPATHIC CONSIDERATIONS

Histiocytic sarcoma is uncommon in humans, but more than that, it has a tendency towards irregular presentations across multiple organ systems and even imitates other disease processes.<sup>3</sup> The diagnosis therefore requires pathology studies, as it is important to rule out other suspected neoplasms before assigning histiocytic sarcoma. Microscopic examination may disclose "large tumor cells with variable pleomorphism but often resembling mature histiocytes," and malignant cells often invade lymphatic organs like the spleen and lymph nodes.<sup>4</sup> Tumors are prone to necrosis, and display "increased mitotic figures and apoptotic cells."<sup>4</sup> A study by

Janke and Rehg on mouse histiocytic sarcoma revealed that in 80% of cases, both spindle cells and small round cells commonly present even within the same tissue specimen.<sup>3</sup> (Mice were utilized because they, in contrast to humans, have a high incidence of the disease and generate more samples for analysis.) Cells in histiocytic sarcoma can organize into discrete nodules, diffuse sheets, or sometimes both, and lymphocytes were variably found interspersed among the malignant cells. Diagnosis requires immunohistochemistry staining (IHC) positive for CD68, CD163, and lysozyme.<sup>4</sup> Other positive markers are possible in the diagnosis. Stains that indicate a negative diagnosis include "T-cell, B-cell and follicular dendritic cell markers" (CD21, CD23, CD35) and Langerhans cell markers (CD1a and CD207).<sup>4,5</sup>

Following our patient's tissue biopsy, surgical pathology reports and microscopic examination showed malignant cells. Specifically, "diffuse lymphoid proliferation composed of medium to large lymphoid cells with vesicular nuclei and small distinct nucleoli [with] single-cell necrosis" was noted throughout the specimens. Immunoperoxidase stains were strongly positive for CD4, CD43, CD56, CD68, CD163, Factor XIIIa (weak), Ki-67, and lysozyme. Given these findings, the patient was assigned a diagnosis of histiocytic sarcoma.

Considering the advanced nature of the patient's disease, he was immediately started on an aggressive inpatient therapeutic regimen that included cyclophosphamide, doxorubicin hydrochloride, vincristine sulfate, and prednisone (CHOP). It was also deemed appropriate to schedule an immediate transfer of the patient to a specialized facility to begin chemotherapy.

## Osteopathic Considerations

Recalling the five osteopathic models (including the structural, respiratory-circulatory, metabolic, neurologic, and behavioral models) can provide a useful guide in treating the patient as a whole person.<sup>6</sup> In this case, the structural and respiratory-circulatory models were overall contraindicated due to the malignant nature of the patient's disease. However, following the neurologic model, he would likely have exhibited several Chapman's points, given his multiple-organ involvement. Consider: possible scattered points in the clavicular region corresponding to the masses found on the patient's upper lip and soft-tissue neck regions (assuming associated visceral involvement); right anterior ribs 3 and 4 at the sternocostal junction, corresponding to the right upper lung segment; 1 cm superior and lateral to the umbilicus, corresponding to the perirenal mass.<sup>7</sup> Concerning counterstrain, the patient's bilateral knees would likely have had some point tenderness. Treating Chapman's points and counterstrain points is a simple and low-risk method of pain relief. Furthermore, in patients with terminal illness, the behavioral model, which aims to optimize a patient's psychological and spiritual health, can be particularly beneficial.<sup>6</sup> Facilitating consults with psychologists and social workers, visits from hospital chaplains, and time spent with family are intended to help a patient cope with any stress and depression, and generally guide the patient through such a challenging personal time.

## FOLLOW-UP AND OUTCOMES

Unexpected events in this patient's case were limited to his short hospital stay. However, on his second day of stay, a deep vein thrombosis (DVT) was discovered. The patient complained of newly increased pain and edema in his right calf. On physical examination, his skin was warm to the touch and without discoloration. A venous duplex ultrasound revealed a completely occlusive venous thrombosis in the right posterior tibial vein, which was subsequently treated with full-dose Lovenox. The patient was also encouraged to ambulate frequently.

The patient was lost to further follow-up after transfer to the specialized facility.

## DISCUSSION

Histiocytic sarcoma is a rare and easily missed diagnosis that is typically indicative of rapid patient decline and poor outcomes. In this case, we discussed a 56-year-old white male who presented with a 2-week history of widespread soft-tissue nodules, shortness of breath, and knee pain. Diagnosis of histiocytic sarcoma was established obtaining a biopsy sample of the nodule and performing immunoperoxidase staining.

The rarity of this disease makes it somewhat sparsely covered in the literature, and data providing appropriate treatment modality are limited.<sup>8</sup> Presenting symptoms can vary from widespread extranodal disease to even the involvement of one singular lymph node.<sup>9</sup> Some evidence indicates that the size of presenting tumors may affect outcomes.<sup>10</sup> Our case agrees with the literature in that the presentation of the patient and the course of his disease were severe in both timing and progression up to presentation.

### FIGURE 1:

Soft-tissue nodules on abdomen.



Unfortunately, losing this patient to follow-up meant that his disease evolution and ultimate outcomes cannot be considered. Literature indicates overall survival with a diagnosis of histiocytic sarcoma is short. One study showed that out of a cohort of 158 patients, the average overall survival after diagnosis was 6 months.<sup>11</sup> With this in mind, having a suspicion of histiocytic sarcoma is important in the face of characteristic patient presentation to be able to correctly and promptly diagnose it, thereby affording patients the most time to seek specialized treatment.

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## BRIEF REPORT

# HUMAN PARECHOVIRUS MENINGOENCEPHALITIS IN AN EIGHT-DAY-OLD INFANT

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## KEYWORDS

Human Parechovirus

Meningoencephalitis

Neonatal meningitis

Viral meningitis

## ABSTRACT

Human parechovirus (HPeV) infections have been increasing in the United States since May 2022, according to the Centers for Disease Control and Prevention. HPeVs are a member of the *Picornaviridae* family and share similarities with enteroviruses, though they differ in genomic structure. HPeV commonly affects children, with disease manifestations ranging anywhere from an asymptomatic infection to severe disease. HPeV typically affects the gastrointestinal and respiratory tracts but may rarely also cause severe infection of the central nervous system (CNS), leading to sepsis-like illness, meningitis, and encephalitis. Of the 19 established serotypes of HPeV, serotypes A1 and A3 are most commonly identified in humans. HPeV serotype A3 is of particular importance as it more commonly causes sepsis and CNS infection, especially in children. In the United States between 2014 and 2016, a total of 2758 cases of enteroviruses and parechoviruses were reported to the National Enterovirus Surveillance System. Of those cases, 2.3% were distinguished as HPeV A3. This case details the clinical course of an eight-day-old infant with HPeV meningoencephalitis. The infant initially presented with fever and other nonspecific symptoms, which later progressed to include diffuse erythroderma and seizure activity. Although current management of HPeV meningoencephalitis involves supportive care and close monitoring, determining HPeV as a cause of infection is important due to the long-term sequelae that patients may develop. Potential complications of infection include white matter lesions of the brain, cerebral palsy, developmental delay, and visual impairment. This case was documented to increase awareness of the rising incidence of HPeV infections in children in the United States, as well as to detail the signs and symptoms of HPeV meningoencephalitis in a neonate.

## INTRODUCTION

Human parechoviruses (HPeVs) are nonenveloped positive-sense single-stranded RNA viruses with an icosahedral capsid.<sup>1-3</sup> They are primarily transmitted via a fecal-oral route, but may also be transmitted through the respiratory system.<sup>2,4</sup> They share the family Picornaviridae with enteroviruses, some well-known members including coxsackie virus, poliovirus, rhinoviruses, and hepatitis A virus, although they share no more than 30% of amino acid identity with these species.<sup>1,4</sup> There are currently four known species of parechoviruses: parechovirus A through

D,<sup>4,5</sup> Parechovirus A is the only known species to infect humans, namely, “human parechovirus.”<sup>2</sup> There are currently 19 established genotypes of HPeV, with A1 being the most common, followed by A3 and A6.<sup>2,3</sup>

HPeV infections range in severity from mild respiratory or gastrointestinal illness to severe systemic disease in some cases.<sup>1,2</sup> HPeV A1 and A6 more commonly present with mild respiratory or gastrointestinal illness, whereas HPeV A3 is more commonly implicated in severe disease, including sepsis and central nervous system (CNS) infection.<sup>1,7</sup> Severe HPeV infection is more often reported in young infants and tends to disproportionately affect children under 3 months of age.<sup>2,3</sup> CNS infection includes meningitis and encephalitis and may lead to severe sequelae including cerebral palsy, white matter lesions of the brain, visual impairment, persistent seizures, and neurodevelopmental delay.<sup>2,3,6</sup> In studies performed in Europe and Australia, 16%-19% of children hospitalized with severe HPeV infection showed significant concern for neurodevelopmental delay.<sup>2</sup> There is no currently established treatment for HPeV infection, and treatment goals involve supportive care of the respiratory and circulatory system as well as symptomatic control.<sup>2,4</sup>

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This case report was compiled using de-identified patient information from Spartanburg Regional Medical Center. The patient was under the care of Dr. Hanna Sahhar, MD, FAAP, FACOP. Written informed consent was provided by the guardian of this patient.

Intravenous immunoglobulin (IVIG), inhibition of the viral capsid, and inhibition of 3C protease may be helpful in some cases, but this has not been extensively studied thus far.<sup>2,4</sup>

HPeV and enterovirus infections are not subject to mandatory reporting in the United States, but the Centers for Disease Control and Prevention (CDC) established the National Enterovirus Surveillance System (NESS) in the 1960s for voluntary reporting and surveillance.<sup>1,5</sup> The most recent report from NESS included enterovirus and parechovirus infections in the United States from 2014-2016. Of the 2758 total infections reported during that time, 62 cases of HPeV A3 were identified, which represented 2.3% of reports.<sup>1</sup> HPeV A1 was reported less frequently, ranging from 1.4% of reported cases in 2015 and 2.7% in 2016.<sup>1</sup> Due to voluntary reporting, the true prevalence of these infections may be higher than described. In July 2022, the CDC released a health advisory alert for clinicians due to an increase in HPeV reports in multiple states since May 2022.<sup>3</sup>

It is important to include HPeV in the differential diagnosis for young children presenting with gastrointestinal or respiratory infections due to the recent increase in cases. It is especially important to consider this infection in young infants presenting with fever due to the potential for severe disease in this population. Most patients with systemic HPeV infection present with fever, irritability, rash, and poor feeding, which are nonspecific symptoms that share similarities with many other viral and bacterial infections.<sup>4,7</sup> Patients typically have low to normal white blood cell counts, normal or mildly elevated C-reactive protein, and normal liver enzymes.<sup>4</sup> Cerebrospinal fluid (CSF) pleocytosis is rare with HPeV CNS infection.<sup>2,4,7</sup> If HPeV infection is suspected, a specific polymerase chain reaction (PCR) must be performed as HPeV is not detected with nucleic acid enterovirus testing.<sup>2,7</sup> HPeV may be detected in stool, CSF, urine, and respiratory secretions, but stool and CSF samples are the most sensitive.<sup>2,3</sup> Cell culture is not sensitive for HPeV diagnosis.<sup>3</sup>

This case details the clinical course of an infant less than 30 days of age who developed meningoencephalitis due to HPeV infection. The infant first presented with nonspecific symptoms and a fever of unknown source. The diagnosis of HPeV meningitis was initially established following analysis of CSF and later evolved to meningoencephalitis when the infant developed focal seizure activity and diffusion abnormalities on magnetic resonance imaging (MRI).

## CASE PRESENTATION

An 8-day-old female presented to her primary care physician for a new-onset fever of 101.4°F (38.6°C), decreased oral intake, and loose stools. The patient was born full term at 40 weeks and 1 day gestational age via spontaneous vaginal delivery to a group B-streptococcus-positive mother. The mother received adequate antibiotic coverage with ampicillin prior to delivery. APGAR scores at 1- and 5 minutes following delivery were documented as 8 and 9, respectively. The infant had no sick contacts, and a review of systems was negative for cough, rash, or vomiting. Physical exam findings were significant for prolonged capillary refill, jaundice, and dry mucous membranes.

The patient was admitted to the hospital for a workup of a fever in an infant. On admission, complete blood count revealed no leukocytosis (Table 1). A complete metabolic panel revealed mild hypoglycemia and increased blood urea nitrogen (BUN)/creatinine ratio but was otherwise unremarkable (Table 2). A full septic workup was performed including blood cultures, urinalysis and urine culture, and lumbar puncture including meningitis panel (Table 3, Table 4). The patient was placed on empiric intravenous ampicillin (100 mg/kg every 6 hours) and gentamicin (4 mg/kg every 24 hours), and was monitored for worsening symptoms. CSF analysis revealed normal white blood cell count, normal protein, and slightly decreased glucose (Table 3). A Biofire® Film-array® Meningitis/Encephalitis Panel performed on the patient's CSF was positive for HPeV, formally diagnosing this infant with HPeV meningitis (Table 4). On hospital day two, the patient developed diffuse blanching erythroderma (Figure 1), which is often a finding in systemic parechovirus infection. In the literature, infants with systemic parechovirus infection are said to be "red, hot, angry babies," due to fever, irritability, and rash.<sup>2,3</sup> The patient was monitored closely and noted to improve steadily over the course of 72 hours. The patient was afebrile during the admission and CSF, blood, and urine cultures remained negative.

TABLE 1:

Complete blood count with differential on admission showing normal hemoglobin, hematocrit, leukocyte counts, elevated RDW, and slightly elevated nRBCs.

Complete Blood Count With Differential	Patient's Values	Reference Values
WBCs	7.4	5.0-21.0 x 10 <sup>3</sup> /uL
RBCs	5.39	3.60-6.20 x 10 <sup>6</sup> /uL
Hemoglobin	18.2	12.5-20.0 g/dL
Hematocrit	53.8	39.0%-63.0 %
MCV	99.8	86.0-124.0 fL
MCH	33.7	28.0-40.0 pg
MCHC	33.8	28.0-38.0 g/dL
RDW	16.4 (high)	11.8%-15.2%
Platelets	233	141-359 x 10 <sup>3</sup> /uL
nRBC	0	0.0%-0.0 %
nRBC absolute	0.01 (high)	0.00-0.00 x 10 <sup>3</sup> /uL

Abbreviations: MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; MCV, mean corpuscular volume; nRBC, nucleated red blood cell; RBC, red blood cell; RDW, red blood cell distribution width; WBC, white blood cell

TABLE 2:

Complete metabolic panel on admission showing mild hypoglycemia, elevated BUN/creatinine ratio, elevated anion gap, and low globulin

Complete Metabolic Panel	Patient's Values	Reference Values
BUN	14	5-27 mg/dL
Sodium	141	131-143 mmol/L
Potassium	5.1	3.7-5.9 mmol/L
Chloride	108	99-116 mmol/L
CO <sub>2</sub>	17.9	16.0-28.0 mmol/L
Glucose	47 (low)	50-80 mg/dL
Creatinine	0.39	0.30-0.80 mg/dL
Calcium	9.1	9.0-10.9 mg/dL
Total protein	5.3	4.3-6.9 g/dL
Albumin	3.5	2.7-4.8 g/dL
ALT (SGPT)	20	10-32 IU/L
Alkaline phosphatase	157	60-321 IU/L
AST	63	18-63 IU/L
Total bilirubin	8.7	0.0-12.0 mg/dL
BUN/creatinine ratio	36 (high)	8-23
Osmolality calculated	279	270-350 mOsm/kg
Anion cap	15 (high)	6-13 mmol/L
Globulin	1.8 (low)	2.0-4.5 g/dL
A/G ratio	1.9	0.9-2.4
Corrected calcium	9.5	9.0-10.9 mg/dL

Abbreviations: A/G, albumin/globulin; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BUN, blood, urea, nitrogen; SGPT, serum glutamic-pyruvic transaminase

TABLE 3:

Results of CSF analysis from lumbar puncture showing normal WBC count, slightly decreased glucose, and normal protein

Cerebral-Spinal Fluid Analysis	Patient's Values	Reference Values
Color, CSF	Colorless	Clear/colorless
Number of cells, CSF	12	0-25
Red cell count	7	0-5
WBC, CSF	5	<20/mm <sup>3</sup>
Segmented neutrophils	0	<3%
Lymphocytes	36	70%
Monocytes	64	30%
Glucose, CSF	46	50-80 mg/dL
Protein, CSF	44	15-45 mg/dL

Abbreviations: CSF, cerebrospinal fluid; WBC, white blood cell

TABLE 4:

Biofire® Film-array® Meningitis/Encephalitis Panel performed on the patient's CSF, positive for HPeV

Biofire® Film-array® Meningitis/Encephalitis Panel	Patient's Values	Reference Values
<i>Haemophilus influenzae</i>	Not Detected	Not Detected
<i>Escherichia coli</i> K1	Not Detected	Not Detected
<i>Listeria monocytogenes</i>	Not Detected	Not Detected
Enterovirus	Not Detected	Not Detected
HSV-1	Not Detected	Not Detected
HSV-2	Not Detected	Not Detected
HHV-6	Not Detected	Not Detected
HPeV	DETECTED	Not Detected
<i>Cryptococcus neoformans/gattii</i>	Not Detected	Not Detected
<i>Neisseria meningitidis</i>	Not Detected	Not Detected
<i>Streptococcus agalactiae</i>	Not Detected	Not Detected
<i>Streptococcus pneumoniae</i>	Not Detected	Not Detected
CMV	Not Detected	Not Detected
VZV	Not Detected	Not Detected

Abbreviations: CMV, cytomegalovirus; HHV-6, human herpesvirus 6; HPeV, human parechovirus; HSV-1, herpes simplex virus 1; HSV-2, herpes simplex virus 2; VZV, varicella-zoster virus

FIGURE 1:

Blanching erythroderma rash. Infants with severe HPeV infection are often described as "red, hot, angry babies" in literature due to the triad of fever, rash, and irritability.



The patient was discharged home with return precautions but returned to the hospital later the same day due to new-onset focal clonic movement of the left arm (Figure 2A). The clonic movement evolved to include the right arm along with eye twitching and lip smacking. An electroencephalogram (EEG) was obtained, and evidence of seizure-like activity was recorded including poorly organized background low-voltage rhythms and intermittent,

brief, generalized high-amplitude polyspike discharges with slow waves (Figure 2B). At this time, a consult was made for evaluation by pediatric neurology, who recommended controlling the seizure with a single intravenous dose of phenobarbital (20 mg/kg).

#### FIGURE 2A:

Video of patient experiencing focal seizure of the left arm and associated facial twitching. <https://vimeo.com/764914558/7f35e523c7>



#### FIGURE 2B:

EEG: Background rhythms consist of low-voltage poorly organized mixtures of 8 Hertz rhythms seen posteriorly with additional low-voltage 6-7 temporal theta and low- to moderate-voltage frontal 2-4 Hertz delta activity. Rhythms are generally symmetric and synchronous. Infrequent intermittent, brief, generalized high-amplitude polyspike discharges with slow waves are noted, with the image here the most active 10-second epoch. Impression: Abnormal EEG secondary to infrequent repetitive brief, generalized, high-amplitude polyspike discharges with slow waves.



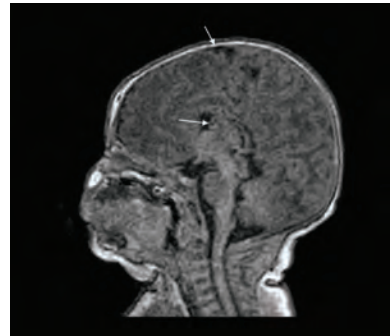
Following phenobarbital administration, the patient remained in stable condition. No focal neurologic deficits were present on physical exam at that time, and she was placed on seizure precautions. A long-term EEG was performed, which revealed epileptic potential consisting of occasional sharp waves excessive for gestational age in the right central and temporal lobes. However, no clear asymmetries, focal slowing, or seizures were recorded during the study. Levetiracetam was initiated with a loading dose of 30 mg/kg orally, and the patient was continued on a maintenance dose of 40 mg/kg/day orally divided twice daily. The patient tolerated the medication well and no further seizure activity was observed during the admission.

MRI of the brain was performed showing multifocal restricted diffusion throughout the periventricular white matter of both cerebral hemispheres, with some extension into the posterior limbs of internal capsules and dorsal left thalamus (Figures 3A&B). These findings are most concerning for recent ischemia, likely due

to parechovirus encephalitis. The proposed mechanism of these findings is direct neuronal injury and venous ischemia along the deep medullary veins. A magnetic resonance angiogram (MRA) of the brain was also obtained to evaluate for intracranial vascular abnormalities that may have contributed to the MRI findings. The MRA of the brain was negative for any major arterial intracranial abnormality, including saccular aneurysm, vascular nidus, or arteriovenous shunting (Figure 4A&B).

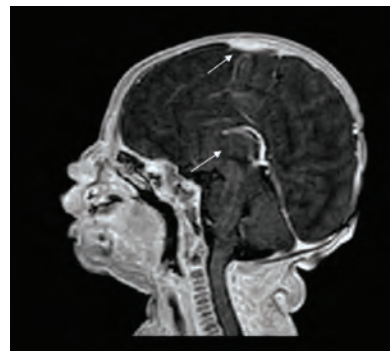
#### FIGURE 3A:

MRI of the brain without contrast



#### FIGURE 3B:

MRI of the brain with contrast showing multifocal diffusion restriction throughout the periventricular white matter of both cerebral hemispheres concerning for recent ischemia.



#### FIGURE 4A:

MRI angiogram of the brain. Image reflecting patent bilateral internal carotid arteries and basilar artery.

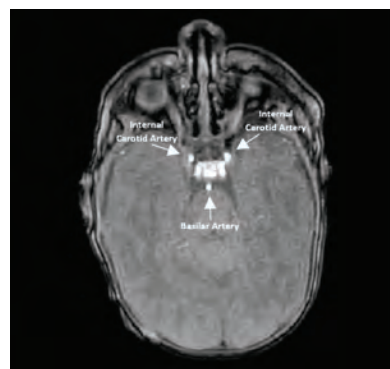


FIGURE 4B:

Patent vasculature and no evidence of major arterial intracranial abnormalities, including occlusion, aneurysm, vascular nidus, or arteriovenous shunt



The patient was discharged with parent education and strict return precautions. A follow-up with pediatric neurology was recommended 1 month following discharge for repeat EEG and medication management. The parents were also instructed to establish care with a neurodevelopmental pediatrician to closely monitor the patient's development due to the abnormal MRI findings. The follow-up examination was unremarkable for focal deficits.

## DISCUSSION

HPeV infections are uncommon in the continental United States, especially those severe enough to cause CNS infection. With a recent increase in HPeV infections in the United States, it may be beneficial to include this virus in the differential diagnosis for children presenting with an acute viral illness. Although care for HPeV infection is mostly supportive, it is important to consider the potential CNS complications associated with this virus.

HPeV more commonly affects the gastrointestinal and respiratory tracts but may spread hematogenously to affect other organ systems, including the CNS. HPeV subtype A3 more commonly causes severe systemic disease when compared with other subtypes. Of the children infected with known HPeV A3, those presenting with severe systemic disease tend to be younger in age compared to those presenting with milder gastrointestinal or respiratory symptoms. Most severe cases of HPeV infection occur in infants younger than 3 months of age. This has important implications in the neurodevelopment of young children with HPeV infection and warrants close monitoring for long-term neurologic complications.

Inflammation and cytotoxicity associated with infection of the brain and spinal cord may cause irreversible neurologic damage. Infection of the CNS increases the risk of cerebral palsy, anoxic brain injury, and white matter lesion development. This may subsequently result in neurodevelopmental delay, visual impairment, delays in motor development, recurrent seizures, and even death.

## CONCLUSION

Diagnosis of HPeV as the cause of infection in children is important when considering that young infants are at increased risk for severe disease. The increase in incidence of HPeV cases in the United States should encourage testing for this virus in infants less than 90 days old presenting with a fever, as well as children presenting with gastrointestinal and respiratory illnesses. Close monitoring and follow-up are important in young infants with HPeV infection and may aid in earlier detection of CNS manifestations and improve neurodevelopmental outcomes.

## Literature Search and Data Sources

Literature review was performed by using Google Scholar and PubMed. Search criteria included "human parechovirus meningitis," "parechovirus encephalitis," "neonatal encephalitis," and "human parechovirus 3 outcomes." Other sources were acquired from the citations used in other publications. Dates of literature review are between October 1, 2022, and March 30, 2023.

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## BRIEF REPORT

# INTEGRATING BEHAVIORAL HEALTH AND PRIMARY CARE: A REVIEW OF EVIDENCE AND RECOMMENDATIONS FOR OSTEOPATHIC FAMILY PRACTICE

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Mental health

## ABSTRACT

Osteopathic family physicians embody the philosophy of whole-person care, including using a biopsychosocial approach to incorporate mental health into patient care. The creation of the Behavioral Health Integration Collaborative increased support for a system-level adoption of whole-person care in primary care settings. With the increase in both mental health symptoms and diagnoses among Americans, and the increasing support for integrated physical and behavioral healthcare in the primary care setting, this paper shares various approaches, as well as challenges to, adapting integrated care in the primary care office. This includes reviewing best practices for implementing this care approach. The two leading models for integrated care are the Primary Care Behavioral Health (PCBH) model and Collaborative Care model (CoCM). Both models include clinically embedding licensed mental health professionals into the primary care setting, thus increasing access to colleagues with this specialized approach. The PCBH model utilizes a warm hand-off approach, resulting in a collaboration between physician and mental health provider in the care of the patient. The CoCM focuses on a registry of patients who are overseen by a behavioral health manager with treatment decisions guided by a consulting psychiatrist. Blended models are also emerging to better suit the needs for different practices and the patient populations they serve. Challenges to full implementation include acquiring buy-in from practice leadership, hiring appropriately trained mental health providers, and defining billing and coding procedures.

## INTRODUCTION

As osteopathic family physicians, holistic care is at the heart of our practice. Across diverse practice settings and patient populations, we treat the whole person using the tenets of osteopathic medicine grounded in a biopsychosocial approach.<sup>1</sup> Integration of mental health into medical treatment plans, which has contributed to the success of primary care and family medicine for decades,<sup>2</sup> is integral to our practice philosophy. A foundational sentiment of our profession says, "To find health should be the object of the doctor; anyone can find disease."<sup>3</sup> Whole-person care rests at the intersection of physical, mental, emotional, and spiritual aspects of life.<sup>1-3</sup>

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Recent national conversation about whole-person care has amplified these philosophical concepts. In the wake of the COVID-19 pandemic, the Behavioral Health Integration Collaborative was formed, bringing together eight national physician organizations (including the American Osteopathic Association and the American Academy of Family Physicians) to advance the system-level adoption of whole-person care in the primary care setting.<sup>4,5</sup>

For osteopathic family physicians in practice, it is critical to understand how these system changes are different from how we inherently practice as osteopathic physicians. This paper aims to describe the landscape of mental health access, highlighting the pressures specific to primary care, to educate the osteopathic family physician on the leading and emerging evidence driving behavioral health integration system change, and to offer best practices and common pitfalls for implementing behavioral health within osteopathic family medicine practices



## THE CURRENT LANDSCAPE OF MENTAL HEALTH ACCESS

One in five American adults experience some form of mental illness, and less than half of those with an identified concern receive treatment.<sup>6</sup> Wait time, cost, access, and stigma serve as significant barriers to timely, holistic care.<sup>6</sup> Groups with multiple marginalized identities are at significant risk; for example, Black transgender and nonbinary youth report disproportionate rates of suicide risk, with 59% seriously considering suicide and one in four attempting suicide in the past year.<sup>7</sup> The COVID-19 pandemic has exacerbated these problems. Prevalence of depression and anxiety was higher during the pandemic compared to earlier years, especially among individuals under age 60 years, racially and ethnically minoritized groups, and those with educational levels less than a four-year college degree.<sup>7,8</sup>

Given these realities, primary care is now the “de facto” frontline of mental health care.<sup>6</sup> Upwards of 70% of primary care concerns have a mental health component, and family physicians prescribe a significant portion of psychotropic medications.<sup>6</sup> Integrated care is uniquely positioned to bridge the gaps between demand for mental health services and access to appropriate treatment.<sup>6</sup> Mental health care is often unaffordable without insurance; those with private insurance may face limitations that inhibit access, as specialized mental health providers may be “out of network” or do not accept insurance, thus driving more individuals back to primary care.<sup>9</sup>

The National Behavioral Health Integration Collaborative aims to provide sustainable practices for physicians and behavioral health providers to successfully work together.<sup>5</sup> This collaborative encourages implementation of models that recognize each clinician’s unique contributions and conceptualization of all presenting concerns in the context of the patient’s social identities, lived experiences, and social determinants of health.<sup>5</sup> For successful integration, the two specialties must work together to create a culture of inclusivity and a commitment to social justice, while also addressing health care disparities and maintaining mutual respect and appreciation for their roles.

## INTEGRATED CARE

### Background and Basics

Integrated care is defined as “the care a patient experiences as a result of a team of primary care and behavioral health clinicians working together with patients and families using a systematic, cost-effective, and evidence-based approach to provide patient-centered and holistic care to a population.”<sup>10</sup> This concept can be implemented using a variety of pathways and models (Figure 1).<sup>10</sup> The osteopathic philosophy shares similar themes of holding the patient at the center of care while seeing the patient as a whole person.

FIGURE 1:

The integrated care tree of models and clinical pathways rooted in perspectives Adapted from the Collaborative Family Healthcare Association, 2023<sup>10</sup>



Integrated care is delivered along a spectrum, ranging from coordinated, referral-based models, to co-located with basic collaboration principles, to fully integrated care (Table 1).<sup>11</sup> In coordinated care, each specialty works in parallel to the other, and while clinicians might consult each other and collaborate on care plans, they remain systematically separated, with the patient having to traverse between them.<sup>11</sup> In co-located care, clinicians are physically seeing patients in the same office and may work with the same patient for similar concerns. However, each provider maintains separate treatment plans, electronic health records, and other distinct workflows that limit cohesion in care and communication.<sup>11</sup> In fully integrated care, all clinicians work together, often consulting with each other at the time of care delivery, working from shared plans, workflows, and structures that create a unified holistic experience for the patient.<sup>11</sup>

TABLE 1:

Levels of integrated care, from coordinated, to co-located to integrated care

COORDINATED CARE		CO-LOCATED CARE		INTEGRATED CARE	
Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Minimal Collaboration	Basic Collaboration at a Distance	Basic Collaboration Onsite	Close Collaboration with Some System Integration	Close Collaboration Approaching an Integrated Practice	Full Collaboration in a Transformed Practice
<p><b>Level 1:</b> Separate facilities, separate systems; clinicians rarely communicate about cases.</p> <p><b>Level 2:</b> Separate systems at separate sites, but engage in periodic communication about shared patients, mostly through telephone, letters and notes.</p>		<p><b>Level 3:</b> Separate systems, shared facilities. Proximity supports occasional face-to-face meetings and regular communication.</p> <p><b>Level 4:</b> Some common systems in common. Regular face-to-face interactions among PCPs and BHCs, coordinated treatment plans for difficult patients. Basic understanding of each other’s roles and cultures.</p>		<p><b>Level 5:</b> Mental health and others share the same sites, vision and systems. All providers are on the same team, have developed an in-depth understanding of each other’s roles and areas of expertise.</p> <p><b>Level 6:</b> Full collaboration into one system, team and patients view the operation as a single health system treating the whole person, for all patients.</p>	

Adapted from Substance Abuse and Mental Health Services Administration, 2023.<sup>11</sup>

### Two Leading Models: Primary Care Behavioral Health and Collaborative Care

Two key models for integrated behavioral health have been studied in the literature (Table 2).<sup>12</sup> The Primary Care Behavioral Health (PCBH) model is characterized by having behavioral health clinicians or consultants (BHCs) working together with primary care providers (PCPs) utilizing warm hand-offs as a key component to collaboration.<sup>12</sup> A warm hand-off occurs when a PCP actively

introduces a BHC to a patient during a primary care office visit to jump-start engagement with the BHC for services.<sup>13</sup> BHCs provide support for the full spectrum of mental and behavioral health concerns, using a functional and contextual perspective to identify and prioritize the patient’s goals.<sup>14</sup> BHC services are brief, problem-focused, and behaviorally oriented. For patients with concerns that cannot be safely or effectively addressed in primary care, the BHC works to help the patient successfully engage into the specialty mental health environment.<sup>12</sup> Collaboration with a behavioral health team member at key moments in care allows the PCP to move forward with the schedule, reducing clinician frustration from running late while ensuring that challenging cases are shared by a clinician with the appropriate training and expertise.<sup>14,15</sup> Further, patients are given immediate and affordable access to care.

The Collaborative Care Model (CoCM) is characterized by the creation of a registry, overseen by a behavioral health manager (BHC).<sup>14</sup> Patients are identified through evidence-based screening, such as the PHQ-9 or GAD-7,17 and enrolled into a registry.<sup>13-16</sup> Treatment decisions are maintained under the purview of the PCP with guidance from a consulting psychiatrist (CP).<sup>14</sup> The CP meets regularly with the BHC to review cases, and together, the BHC and CP use an algorithm-based stepped-care model informed by evidence-based assessments for treatment decisions.<sup>17</sup> Patients tend to meet with their care manager for brief remote check-ins that can be offered over the phone, with episodes of care typically lasting from 3 to 12 months.<sup>13</sup>

TABLE 2:

Key features of two leading models of integrated care

Primary Care Behavioral Health Model	Collaborative Care Model
Integrated behavioral health consultant available for warm hand-offs	Integrated care manager overseeing registry of patients with mental health diagnoses
Evidence-based previsit screening for mental health conditions (ie, PHQ2/9, GAD2/7, AUDIT-C) by PCP to help identify care needs	Evidence-based screening and diagnosis by PCP to help identify care needs; measurement used regularly by PCP/behavioral care managers to systematically track treatment
Evidence-based behavioral treatments delivered within primary care setting	Algorithm-based stepped care using evidence-based tools to guide treatment, with decision support for complex mental health cases by consulting psychiatrist (CP)
Treatment duration: typically <6 sessions	Treatment duration: 3 to 12 months
>30 randomized controlled trials demonstrating effectiveness	>90 randomized controlled trials demonstrating effectiveness

Adapted from American Psychological Association, 2021.<sup>14</sup>

Blended models are also emerging, which combine aspects of both PCBH and CoCM within primary care settings.<sup>12</sup> In these settings, PCPs and BHCs work closely on shared teams, using warm hand-offs to episodically assist patients through behavioral management with mild-moderate mental health concerns, and engaging patients

with depression and anxiety into the CoCM arm of care.<sup>12</sup> Blended models have the potential to offer “the best of both worlds,” in that patients and PCPs appreciate the immediate access provided through the in-office BHC, while also benefitting from the high-level psychiatric consultation in the CoCM model.<sup>12</sup> Consulting psychiatry can also be protocol-driven treatment and is automatically utilized for severe or intense cases.<sup>12</sup>

### Core Team Members

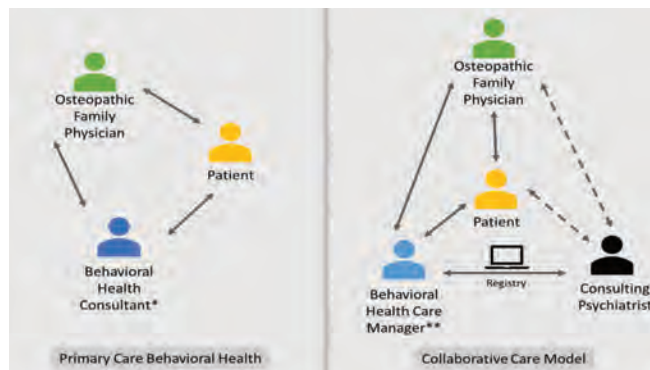
Integrated care models (both PCBH and CoCM) depend on a multidisciplinary team of professionals who are clinically embedded into the primary care setting; the teams in each of these models are slightly different (Figure 2).<sup>13</sup>

In PCBH, BHCs are licensed mental health clinicians who are trained to work closely with PCPs to empower patient self-management of health concerns.<sup>12</sup> BHCs differ from traditional therapists because they are brought in by the PCP to deliver brief problem-focused services.<sup>12</sup> The goal is to address issues before concerns escalate to require more complex specialized mental health care. BHCs work with patients on specific behavioral issues, such as medication adherence, smoking cessation, insomnia, and sleep hygiene; they can also be engaged for anxiety, depression, trauma, bereavement, relationship issues, and substance use concerns.

Alternatively, in CoCM, BHCs are the novel team members.<sup>13</sup> BHCs can be psychologists, social workers, registered nurses, or similarly-trained individuals; their primary role is to oversee the registry of primary care patients with mental health diagnoses while leveraging algorithmic stepped-care tools to engage patients with guidance from a CP.<sup>14</sup> In this model, the CP infrequently communicates with the clinical team, instead engaging through the BHC to manage the registry.<sup>14</sup>

FIGURE 2:

Multidisciplinary team members in the two key models of integrated care. Adapted with permission from AIMS Center.<sup>13</sup>



\*Behavioral Health Consultant refers to an embedded mental health professional in a primary care setting who provides interventions for medical conditions that have a behavioral health component and does this for the entire population of the clinic.

\*\* Behavioral Health Care Manager refers to an embedded mental health professional in a primary care setting who provides treatment to patients with behavioral health diagnoses.

Solid line indicates frequent communication; dashed line indicates infrequent communication.

## IMPLEMENTATION INTO OSTEOPATHIC FAMILY PRACTICE

Getting started with implementing integrated behavioral health into a primary care practice depends on executing a few crucial factors successfully (Table 3).<sup>20,21</sup> This process begins with making the business case for hiring appropriately trained staff, including start-up resources to support change management. The three major areas of potential initial investment are hiring behavioral health professionals, engaging with a CP, and delineating billing and coding procedures.<sup>4,13</sup>

## Hiring and Training Behavioral Health Professionals

Whether implementing PCBH or CoCM, behavioral health professionals are essential members of an integrated behavioral health team and will need to be hired into a family practice. While BHC postdoctoral-level training programs exist in the United States, the distribution of appropriately trained behavioral health consultants is variable by geographic location.<sup>19</sup> Therefore, it is incumbent upon the practice leaders to be attuned to this variance during the hiring process to ensure the appropriate understanding of integrated care and a proficiency in behavioral health practice. Variances in training, background, and context explain some of

**TABLE 3:**  
Best practices for behavioral health integration into osteopathic family practice

<b>Leadership Mission and Vision for Integrated Care</b>	Organizational leaders need to frame importance of integration and provide resources and funding support to embed properly trained mental health professionals within the primary care setting
<b>Shared Goals and Philosophies</b>	Osteopathic philosophy aligns strongly with integrated care principles; an osteopathic physician can establish clear goals for the practice to support whole-person care
<b>Clear Roles and Expectations</b>	CPs and BHCs benefit from clarity in the details related to professional titles, location in clinic, and accountabilities in clinical expertise. This improves efficiency, reduces redundancy, and allows the entire team to take advantage of the division of labor, thereby accomplishing more than the sum of its parts
<b>Mutual Trust and Communication</b>	Team members earn each other’s trust over time, by establishing and refining multiple lines of communication; this creates strong norms of reciprocity and greater opportunities for shared achievement
<b>Designing Protocols and Workflows</b>	Efficiency is also created when clear workflows are delineated for how patients will access BHC services and how patients will be routed through the clinical spaces for their care. Defining previsit and in-visit screening frequency and methods (ie, PHQ/GAD), initiation of warm hand-offs, orchestration of offices for each team member to use, and visit closure and follow-up planning are all crucial to outline during implementation.
<b>Measurable Processes and Outcomes</b>	Team members develop metrics together; this implements reliable and timely reporting using iterative approaches to improving care in real-time, improving systems in addition to enhancing care.
<b>Demonstrating Value and Financial Stability</b>	Efficiency is also created when clear workflows are delineated for how patients will access BHC services and how patients will be Behavioral health integration requires start-up funding to hire appropriately trained BHCs, but practices can soon break even or create revenue if coding and billing procedures are utilized to capture productivity of visits and warm hand-offs

Adapted from American Psychological Association, 2021.<sup>13</sup>

the differences in work culture between primary care and mental health settings.<sup>15</sup> Osteopathic family physicians should also be aware that the busy fast-paced environment of a typical primary care practice can seem quite different than typical mental health settings, where schedules are typically fixed, reasons for seeking care are defined at the outset, and data privacy and confidentiality are paramount.<sup>14,21</sup> For example, in primary care, patients present with a wide range of health issues that are triaged accordingly throughout episodes of care and may be referred on to specialty services as needed. Specialty mental health environments, on the other hand, tend to have a focused scope and clearer set of patient expectations at the outset. These differences may initially be less comfortable for a mental health professional not accustomed to the same level of flexible boundaries, shifting roles, and continuity of relationships over time and across many family members and generations.<sup>15</sup> Having this insight, as well as searching for potential hires who have thrived working in fast-paced medical environments, are essential to facilitate a smooth onboarding process and success in the position.<sup>21</sup>

### Engaging with Consulting Psychiatry

Finding consistent psychiatric referral resources can be challenging, putting many osteopathic family physicians in the position of managing or stabilizing psychiatric conditions within the primary care setting. Leading researcher and CP, Lori Raney, MD, has observed, “The shortage of a sufficient psychiatric workforce to address these needs, coupled with forces such as stigma that deter engagement in treatment, has led to the call for psychiatrists to work with other professions to develop new delivery models to provide effective care to the greatest number of people possible.”<sup>21</sup> Thus, despite variance by demographic region, the development of the role of CP has also been emerging within health systems and communities across the country.<sup>23</sup>

A CP is defined as a licensed, credentialed, and specialty-trained psychiatrist serving as a leader, educator, and champion of the CoCM model.<sup>21</sup> Psychiatrists working in these roles provide direct and indirect consultation to PCPs and BHCs within a defined primary care population, which may be organized by patient panel or care setting.<sup>21</sup> This role is a required member of the clinical team for practices utilizing the CoCM model for both care and billing. Indirect consultation, also known as “curbside consultation,” is the most frequent type of consultation utilized in this model. Here, support is given by the psychiatrist to the PCP via discussing patient care plans without the psychiatrist directly evaluating patients; the expectation is the PCP will implement the recommendations at their discretion.<sup>21</sup> Direct consultation, or face-to-face evaluation by the psychiatrist, is reserved for patients who do not respond to indirect consultation or for whom the primary care team requests assistance with diagnostic clarification.<sup>21</sup> In this case, care responsibility remains with the PCP, however, the CP does not order additional workup and provides recommendations only for the PCP to utilize at their discretion.<sup>21</sup>

Osteopathic family physicians may already be working with psychiatrists in their communities, hospital systems, or organizations. This is an efficient opportunity to partner with an existing colleague who likely is already a good fit in culture, workflow, and philosophy when initiating integrated behavioral

health. Contracting for partial time availability for consultation can be done to appropriately bill for services. Of note: recent coding guidelines do not require the CP to provide care on-site, as long as appropriate documentation is completed in the primary care electronic health record.<sup>4,9</sup>

### Defining Billing and Coding Procedures

Over the past few years, Current Procedural Terminology (CPT) codes have been added to create value for integrated behavioral health services.<sup>4</sup> While not an exhaustive list, there are several codes that a practice can use as a starting point (Table 4).<sup>4</sup> Codes can be used to account for time spent in visit-based care (common in the PCBH model), as well as total time spent per month on integrated behavioral health services (common in the CoCM model).

TABLE 4:

Relevant CPT codes to be used in integrated behavioral health in primary care<sup>4</sup>

<b>Counseling Risk Factor Reduction and Behavior Change Intervention</b>	<i>Preventive Medicine</i> <ul style="list-style-type: none"> <li>• 99401, 99402, 99403, 99404 (Individual)</li> <li>• 99411, 99412 (Group)</li> </ul> <i>Behavior Change Interventions</i> <ul style="list-style-type: none"> <li>• 99406-99407 Smoking and tobacco use cessation counseling visit</li> <li>• 99408-99409 Alcohol and/or substance (other than tobacco) abuse structured screening and brief intervention (SBI) services</li> </ul>
<b>Psychotherapy</b>	<ul style="list-style-type: none"> <li>• 90832, 90834, 90837 Psychotherapy (30, 45, 60 min)</li> <li>• 90833, 90836, 90838 Psychotherapy when performed with E/M service</li> <li>• 90853 Group psychotherapy</li> </ul>
<b>Health Behavior Assessment and Intervention</b>	<ul style="list-style-type: none"> <li>• 96156-96171 (Individual, Group, Family) Focus on psychological, behavioral, emotional, cognitive, and interpersonal factors, and factors complicating medical conditions and treatments</li> </ul>
<b>Care Management</b>	<ul style="list-style-type: none"> <li>• 99484 General behavioral health integration care management</li> </ul>

### CONCLUSION

National support for behavioral health integration creates an important opportunity for osteopathic family physicians to model the philosophy of practice, which has grounded our profession throughout its history. In addition to the success factors at the practice level, institutional leadership support is crucial to fund the start-up costs associated with hiring, training, and implementing change management for these models.<sup>5</sup> Though transformation in health care can be challenging, the benefit is a strengthened clinical team who together can deliver outstanding clinical care, commit to the mental health of its population, create return on investment, and invigorate joy in work, thereby modeling and thriving within the Quadruple Aim for patients, staff, and the community.

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# PATIENT EDUCATION HANDOUT

## ROTATOR CUFF INJURIES

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### WHAT IS A ROTATOR CUFF?

A rotator cuff is a group of muscles and tendons that hold the arm in the shoulder socket and allow the arm to rotate and reach overhead.<sup>1</sup> These muscles move the uppermost portion of the arm and the tendons connect the muscles to bones. The rotator cuff consists of four muscles, the supraspinatus, subscapularis, infraspinatus, and teres minor. These muscles allow for the following actions: abduction (reaching overhead), internal rotation (placing a hand over the heart), and external rotation (opening a door).<sup>1</sup>

### HOW CAN YOU INJURE THE ROTATOR CUFF?

The rotator cuff can be injured directly or from long-term wear and tear. Direct injury to the rotator cuff can occur from falling on the shoulder, car wrecks, or dislocations.<sup>2</sup> Wear and tear occurs naturally as people age. Repetitive motions from weightlifting and overhead activities like painting and carpentry can increase the risk of rotator-cuff injury.<sup>2</sup> Athletes are prone to injury from repetitively using the muscles as frequently seen with tennis players and baseball pitchers.<sup>2</sup>

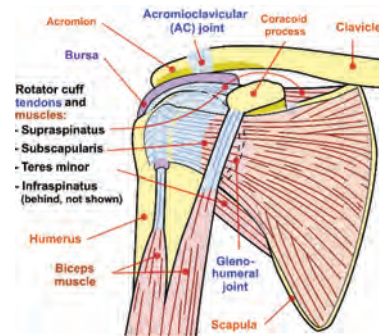
FIGURE 2:

Common motions that use the rotator cuff



FIGURE 1:

Rotator cuff<sup>5</sup>



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# PATIENT EDUCATION HANDOUT

## ROTATOR CUFF INJURIES

### COMMON SIGNS AND SYMPTOMS

- Decreased strength in overhead task
- Difficulty brushing hair or reaching for a glass
- Pain or deep ache in the shoulder joint
- Bruising
- Swelling
- Cracking and popping sensation when moving arm in certain positions

### WHAT SHOULD I DO?

Make an appointment with your doctor. A rotator-cuff injury can range from a mild/partial tear to a more severe full tear.<sup>2</sup> The doctor perform a physical exam and may order imaging. The imaging may include an MRI, which visualizes the soft tissue and tendons to diagnose the specific type of injury.<sup>1</sup>

### COMPLICATIONS OF NOT SEEKING TREATMENT

**Adhesive capsulitis (frozen shoulder):** Patients with rotator-cuff injuries may stop moving their shoulder to alleviate pain.<sup>4</sup> Without movement, the shoulder joint can stiffen and develop decreased range of motion.

**Tendinitis:** A rotator-cuff injury can trigger long-term inflammation that may lead to lasting pain and further breakdown of the tendons.<sup>1</sup> This can cause weakness and tears that require surgery.

**Arthropathy:** If a mild rotator-cuff injury is left untreated, it can become more severe and lead to bone erosion, called cuff tear arthropathy.<sup>3</sup> This causes permanent loss of range of motion in the shoulder.

### TREATMENT OPTIONS<sup>2-4</sup>

Treatment options depend on the exact injury to the rotator cuff, but some options include:

- Activity modification and rest
- Medications such as nonsteroidal anti-inflammatory drugs (NSAIDs) or corticosteroid injections to reduce inflammation and pain
- Physical therapy to increase strength and improve range of motion
- Surgery to clear and repair the damaged tissue

It is important to talk with your doctor when you are having pain in your shoulder/rotator-cuff area. With a treatment plan, patients can expect the recovery to take several months, but will likely get back to regular activities with reduced or no pain.

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# PATIENT EDUCATION HANDOUT

## VAPING

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### WHAT IS VAPING?

Vaping is the act of inhaling aerosols from battery-powered devices called electronic cigarettes, also known as vapes, vape pens, e-hookahs, mods, and electronic nicotine delivery systems (ENDS).<sup>1</sup> These aerosols are produced by the heating of a liquid that contains nicotine, flavorings, cannabinoid (CBD) oils, and other chemicals.<sup>1</sup> Nicotine is a highly addictive and harmful chemical found in tobacco cigarettes and vapes.<sup>2</sup> It is also the substance that keeps people using tobacco products, making it difficult to quit.

Nicotine can rewire and activate the reward pathway in the brain, making people use this product over and over again regardless of risks.<sup>2,3</sup> In some instances, vaping devices can also contain tetrahydrocannabinol (THC), which is the psychoactive compound of marijuana that gives people a “high.”<sup>3,4</sup>

### WHAT SYMPTOMS ARE ASSOCIATED WITH VAPING?<sup>1,4-6</sup>

- E-vaping–associated lung injury (EVALI)
- Heart palpitations
- High heart rate
- Chest pain
- Shortness of breath
- Cough
- Asthma
- Nausea
- Vomiting
- Diarrhea

### WHO IS AT RISK??

- Traditional tobacco smokers
  - » Marketers advertise e-cigarettes as a smoking-cessation tool.<sup>1,2,4,5</sup>
- Youth populations, particularly teens<sup>2-4</sup>
  - » One in four high school students reported the use of e-cigarettes.<sup>2,3</sup>
  - » Since 2014, e-cigarettes have been the most commonly used tobacco product among US youth. In 2020, an estimated 3.6 million middle and high school students reported using an e-cigarette in the last 30 days.<sup>1</sup>
  - » The flavors in vaping devices appeal to younger populations.<sup>2</sup>

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# PATIENT EDUCATION HANDOUT

## VAPING

### WHAT ARE THE CONSEQUENCES OF VAPING?

There are numerous particles that are inhaled when using nicotine-containing vaping products. These particles cause severe swelling and irritation to the lungs.<sup>3,5,6</sup> This will damage the lungs and can lead to scarring and narrowing of the tubes in the lungs that allow for air exchange.<sup>6</sup> Also, when you become addicted to nicotine, you may get symptoms like headaches or cravings when discontinuing or reducing the use of nicotine-containing products.<sup>5</sup>

### HOW CAN A DOCTOR HELP YOU SUCCESSFULLY QUIT VAPING?

- Assess your readiness to quit, acknowledge barriers, and help you set goals.<sup>5</sup>
- Consider referral to behavioral therapy.
- Educate about and recommend nicotine-replacement therapy.<sup>6</sup>
- Recommend complementary resources and healthy habits:
  - » Call (800) QUIT-NOW for mobile help.
  - » Search “How to Stop Vaping” online.
  - » Exercise can help with withdrawal symptoms and improve lung function.<sup>5</sup>

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# PATIENT EDUCATION HANDOUT

## SEASONAL AFFECTIVE DISORDER

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### WHAT IS SEASONAL AFFECTIVE DISORDER (SAD)?

SAD is a seasonal pattern of major depressive disorder, bipolar I disorder, or bipolar II disorder, which occurs repeatedly during particular times of the year. Two seasonal patterns exist: fall-onset SAD and spring-onset SAD.

- **Fall-winter:** More common – major depressive episodes begin in fall to early winter and will remit during the following spring or summer.
- **Spring-summer:** Less common – major depressive episodes begin in spring or summer and will remit by the following fall or winter.

A characteristic quality of SAD is that approximately two-thirds of patients diagnosed with this condition will face a recurrence of distressing symptoms during the following winter. Some studies suggest a geographic component to SAD, with those located further from the equator at an increased risk.

### COMMON SIGNS AND SYMPTOMS

Common identifiable symptoms are fatigue, overeating, craving carbohydrates, and depressed mood, which seriously affects your daily life. These symptoms can range from mild to severe, ultimately influencing your individual treatment plan.

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# PATIENT EDUCATION HANDOUT

## SEASONAL AFFECTIVE DISORDER

### TREATMENT OPTIONS

Various pharmacologic and nonpharmacologic treatments exist for SAD. These treatment options may be used in several combinations and largely depend on what you and your physician decide is right for you. Many major health insurance providers, such as Medicare and Medicaid, help cover mental health treatments, including medication and therapy. Some of these options are discussed in detail below.

- **Light therapy:** a nonpharmacologic treatment option that exposes you to artificial light in order to mimic naturally occurring light sources that may be less prominent during certain seasons. Evidence supports that light therapy can reduce the incidence of SAD. Light therapy is generally recommended to be done for 30 minutes a day, within an hour of waking.
- **Antidepressant medications:** pharmacologic treatment is aimed mainly at depressive symptoms. It is common to start with medicines called selective serotonin reuptake inhibitors (SSRIs); however, other medications, including atypical antidepressants, like bupropion, have also been shown to be helpful for some patients experiencing SAD. Common potential side effects of these medications include headaches, insomnia, and nausea. Your osteopathic family physician may prescribe these medications if deemed necessary. In some instances, your provider may also consult the care of a psychiatrist for further treatment management.
- **Counseling (called psychotherapy):** the most common therapy for SAD is called cognitive behavioral therapy (CBT), which aims to identify and change negative automatic thoughts that may be contributing to depressive symptoms. Additionally, behavioral interventions such as thought records, activity schedules, and practicing mindfulness meditation may be trialed. You can contact a therapist on your own to set up an appointment or ask your doctor for a referral if you need help determining where to seek treatment.

### WHAT CAN I DO TO FEEL BETTER?

Certain lifestyle activities have proven helpful in improving the mood of those persons with SAD. These are commonly referred to as “adjunctive treatments” and include activities such as regular aerobic exercise, outdoor walks, and practicing good sleep hygiene. Aim for at least 30 minutes of aerobic exercise daily, such as walking briskly or biking. Walking outdoors during daylight hours will give you the additional benefit of exposure to sunlight, which has been shown to improve mood. Practice good sleep hygiene by avoiding caffeine, alcohol, and exposure to electronics before bedtime. Going to sleep and waking up at the same time each day will also aid in a proper sleep routine.

### WHEN TO CONTACT YOUR OSTEOPATHIC FAMILY PHYSICIAN

Please see your family physician if any of your symptoms interfere with your daily life or become overwhelming. If you are having feelings of hurting yourself or others, please know help is always a phone call or text away via the suicide and crisis lifeline at 988. Do not hesitate to call or text this resource.

### SOURCES:

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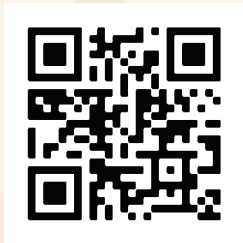
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