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FAMILY PHYSICIANS

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May Your Fall & Winter be Colorful

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Family Medicine: Lessons Learned
from a Practice Transformation Study

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Approach to Parkinson's Disease,
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PATIENT EDUCATION

Gout: Best Ways to Prevent Attack

Movement Disorders: Prevention and
When to See Your Doctor



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- Approach to the Patient with a Tremor
- Approach to Polyarthritis for the Primary Care Physician
- Chronic Abdominal Pain: Tips for the Primary Care Provider
- CPPD: Common and Under Recognized
- Direct Primary Care: Emerging Practice Alternative
- Gas, Bloating and Belching: Tips for the Primary Care Physician
- Newborn Disorders & Nutritional Guidance
- Patient Engagement
(Help define the science of engaged research, provide tangible examples of the impact of engaged research, or answer a question or controversy related to patient engagement.)
- Zika Virus: Guidance for Family Physicians

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The content should include the following:

<i>Abstract</i>	<i>Discussion</i>
<i>Introduction</i>	<i>Conclusions</i>
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March 20 - 23, 2018

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April 28, 2018

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October 5 - 7, 2018

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November 1, 2017
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- Objectivity – Evaluate the submission based on established criteria.
- Communicate – Interact in a professional manner. Be direct, kind and concise.
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OPP Laboratory Presentations & Table-Training
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Teach students, residents & fellows in clinic Participation in
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Other duties as assigned

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One of the Following:

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EDITOR'S MESSAGE

May Your Fall & Winter be Colorful

Amy J. Keenum, DO, PharmD, Editor, *Osteopathic Family Physician*

This month we lead with a nuts and bolts “how to article” article on downloading glucose meters. This is typically done in the endocrinology’s office, why not in the osteopathic family physician office?

Insurance companies dictate the glucose meter they will cover on specific insurance plans and each meter uses a special cable. The computer download produces visual graphs that provide helpful information to use when talking with the patient. For example, OFP’s can look at the same time on different days and see when their patient’s sugars are spiking. Clearly, diabetics being treated with insulin manage their own disease outside the office on a daily basis. We are just the coaches, but without good blood sugar measurements, it is difficult to make suggestions. Having a download glucose meter in our office is another way OFP’s can assist patients in managing their insulin dosing.

The Parkinson’s Disease, Restless Leg Syndrome, and Essential Tremor article discusses the unique, non-pharmacologic osteopathic treatments OFP’s can offer this group of patients. The article focuses on osteopathic manual medicine and describes various techniques to consider for various issues for patients with this condition.

In the research article, *Improving Team-based Care in Family Medicine: Lessons Learned from a Practice Transformation Study*, the authors address training six primary care practices on the tenets of team-based care using the Agency Health Care Research and Quality (AHRQ) Primary Care Version of TeamSTEPPS framework. Research results focus on sharing common challenges in improving team-based care as well as lessons learned from participating in a practice transformation process.

Not to be a spoiler, the clinical images are a skin condition.

Hope your fall and winter are colorful.

FROM THE PRESIDENT'S DESK



ACOFP is Impacting Family Medicine Legislation for the Positive

Rodney M. Wiseman, DO, FACOFP *dist.*
2017 - 2018 ACOFP President

Being heard is important. It is important to our patients, it is important to ACOFP members, and to each of you personally. ACOFP made a bold move in July 2017 to establish its own legislative voice by hiring a Washington, DC - based medical lobbying firm - Alston & Bird. ACOFP is working with them daily to quickly establish our legislative agenda and use it to help shape government initiatives that directly affect Family Medicine and our patients.

ACOFP recently completed four Comment Letters delivered to Seema Verma, Administrator of the Centers for Medicare and Medicaid Services (CMS). Comment Letters are responses to public requests from CMS for comments on issues regarding existing or planned Medicare policies. These letters were written on the following topics: 2018 proposed guidelines for the Quality Payment Program (QPP), the Physician Fee Schedule (PFS), funding for Disproportionate Share Hospitals (DSH), and a proposed Diabetes Prevention Program. Letters to CMS will be posted on www.acofp.org.

Those involved in writing these letters from ACOFP include: the ACOFP Federal Legislation Committee, the ACOFP Advanced Alternative Payment Committee, members of the Board, and staff. Alston & Bird took our collective ideas and put it into the legislative format that CMS is accustomed to reading. ACOFP will continue to comment on significant policy issues from the Osteopathic Family Medicine perspective. ACOFP will keep members apprised of legislative actions via "The View From the Hill," which is sent out via e-mail to all members on Fridays. "The View," as it is called, is a snapshot of the most current and important legislative actions impacting Family Physicians.

CMS is starting to listen. In 2017, CMS lifted several of the Quality Payment Program requirements to lessen the burden on solo, small and rural practices - a large segment of ACOFP's membership.¹

Shortly, we will share ACOFP's top legislative priorities for 2017-2018. We are creating a working plan regarding how we will accomplish these goals. This plan includes interactions with Senators, Congressmen, and lobbying on Capitol Hill. ACOFP will look for ways to have select members represented on government committees, when these opportunities arise.

CHRONIC Care Act

It is a challenging time to practice medicine, but this is the time to step forward, not back. Government and medicine aligned in September 2017 when the CHRONIC Care Act was passed by the Senate and, in separate bills, by the House.²

This law will have a positive effect on Family Physicians and their patients as it broadens the scope of Medicare services and reimbursement for patients with chronic conditions. This is important because 86 percent of the \$2.7 trillion annual healthcare expenditures are for people with chronic diseases and mental health conditions. With the right programs in place, these costs can be reduced.³

Let's look at the cost to the U.S. healthcare system of some of the most prevalent chronic diseases. The total cost of diagnosed diabetes was \$245 billion in 2012. Medical costs linked to obesity were estimated to be \$147 billion in 2008. Annual medical costs for people who were obese were \$1,429 higher than those for people of normal weight. Total annual cardiovascular disease costs to the nation averaged \$316.1 billion in 2012-2013. Currently, two-thirds of Medicare patients have multiple chronic conditions.⁴

The CHRONIC Care Act improves what is already offered by Medicare through the following programs that impact Fee for Service, Medicare Advantage and Accountable Care Organizations (ACOs).

There are four main initiatives contained within the CHRONIC Care Act, they are:

- Independence at Home (IAH): Expands and extends the current program which allows seniors with multiple, complex, and expensive chronic conditions to receive care at home with a team of health care providers. This reduces costs to CMS associated with nursing home care.
- Medicare Advantage: Allows Medicare Advantage plans in every state to tailor benefits to specific patient groups, such as those with two or more chronic conditions, rather than previously mandating the same benefits for all beneficiaries.
- Special Needs Plans (SNPs): SNPs are a type of Medicare Advantage plan that are tailored to specific disabling chronic illnesses. The plan selects a group of physicians who are specially trained to care for these particular patients. There are also specific drugs that are approved by CMS for these patients. Through specifically providing these tailored plans, CMS and physicians hope to improve care and reduce healthcare costs. An application for starting an SNP is available on the Medicare website, or you can contact Debbie Sarason at debbies@acofp.org, or call 847-952-5523 for assistance.⁵

Telehealth

Lastly, the CHRONIC Care Act increases the number of situations where telehealth can be used and reimbursed.⁶ It allows both Medicare Advantage and ACOs greater flexibility in using this much-needed technology. Now patients who are in rural areas, or are critically ill, can check in with their physician without having to travel to their offices. This means increased touchpoints with patients who need it the most, additional reimbursement for physicians who incorporate this technology into practice, and anticipated improved outcomes and reduced costs.

While there are still challenges ahead for Family Physicians, there is also good news. ACOFP pledges to keep its members informed on relevant legislative policy and represent our collective voice to government to help shape these policies.

Rodney M. Wiseman, DO, FACOFP, dist.

Rodney M. Wiseman, DO, FACOFP *dist.*
2017 -2018 ACOFP President

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5. "CHRONIC Care Legislation Improves Care for Medicare Beneficiaries." Web. Accessed on 29 September 2017. www.finance.senate.gov
6. "CHRONIC Care Legislation Improves Care for Medicare Beneficiaries." Web. Accessed on 29 September 2017. www.finance.senate.gov

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RESEARCH ARTICLE

Improving Team-Based Care in Family Medicine: Lessons Learned from a Practice Transformation Study

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Keywords: Team-based care is a key element of a successful primary care practice or patient centered medical home (PCMH). However, before practices can transform to PCMHs, they have to transform their staff to assume new roles and develop needed skills in the new practice paradigm. As medical practices move towards developing increased coordination of care and effective population management this focus has changed how offices function and communicate as a group. The objective of this project addressed training 6 primary care practices (physicians and their office staff) on the tenets of team-based care using the Agency Health Care Research and Quality (AHRQ) Primary Care Version of TeamSTEPPS framework. Common challenges in improving team-based care as well as lessons learned from participating in a practice transformation process are shared.

Team-Based Care

Family Practice

Practice Transformation

Practice Management

INTRODUCTION

The majority of the work of primary care physicians revolves around the prevention and care of chronic disease. Safety and quality of this care is not possible without an effective office team, strong team communication and efficient office systems. Most of the errors for chronic disease and prevention care are related to errors of omission or the failure to employ indicated tests or act on results of monitoring or testing.¹ Error prevention depends on office systems that produce data identifying gaps in care for the total population with a chronic disease, and systems to remind clinicians and encourage patients to obtain prevention items like mammograms, colonoscopies and chronic disease services like eye and foot exams for diabetes. Only between 40-92% of patients obtain services recommended for the management of diabetes (depending on the individual's insurance coverage).² These omissions decrease quality of care and decrease safety by increasing patient mortality and morbidity. Strategies to address these issues such as effective medical practice teams and team communication, has been found to increase patient safety and quality.¹

A current issue that many family medicine physicians face is the risk of burnout. A 2017 survey by Medscape estimated 55% of family medicine physicians are feeling burned out.³ Often there seems to be one more "click" or task that needs to be done during each patient encounter. The survey also cited that 82% of physicians state they spend greater than 5 hours per week on paperwork and administrative issues.⁴ Bodenheimer et al estimated that 24% of a primary care physicians work flow can be done as well by another member of the patient care team.⁵ Team-based care is a model that can help identify those areas to reduce physician burden and to assist in making the family medicine staff more active participants in delivering quality care and population management. This is essential as we navigate how to be successful providers in a changing reimbursement environment and the implementation of the Medicare Access and CHIP Reauthorization Act (MACRA). MACRA's Quality Payment Program requires providers to collect and report quality performance indicators to Medicare beginning in 2017.

MATERIALS & METHODS

The objective of this project addressed this quality and safety gap by training 6 primary care practices (physicians and their office staff) on the tenets of team-based care using the Agency Health Care Research and Quality (AHRQ) Primary Care Version of Team STEPPS framework (<https://www.ahrq.gov/teamsteps/office->

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[basedcare/index.html](#)). TeamSTEPPS is an on-line resource with ready-to-use materials and a training curriculum to successfully integrate teamwork principles into all areas of the health care system, including primary care specific tools. It is scientifically rooted in more than 20 years of research and lessons from the application of teamwork principles developed by Department of Defense's Patient Safety Program in collaboration with the Agency for Healthcare Research and Quality. (AHRQ). TeamSTEPPS has incorporated the best practices from this research into a program to improve the quality, safety, and efficiency of health care by improving communication and other teamwork skills. These skills lead to important team outcomes, such as enabling the teams to:

1. Adapt to changing situations;
2. Gave a shared understanding of the care plan;
3. Develop positive attitudes toward and appreciate the benefits of teamwork; and
4. Provide more safe, reliable, and efficient care.

The largest component of the training was focused on building the capacity and confidence of the medical assistants and nurses to maximize their scope of practice. The project leaders had experience working together to improve diabetes care through the use of a diabetes registry. They discovered that improving diabetes quality indicators was more a function of the office staff than the physicians. Many of the quality indicators were dependent on staff behavior, such as inputting test results into the electronic health record, contacting patients for follow-up care, and scheduling referrals when needed. Participating practices ranged from an office with one physician to a medium sized practice with 9 clinicians and were part of a large primary care network of 36 practices. See Table 1 for characteristics of the 6 participating practices including number of providers, geographic location and percent of population enrolled in Medicaid. Participation was totally voluntary and the Medical Director of each participating practice had to make the commitment to allocate the required time for his office staff and clinicians for training and follow-up. These practices were already certified as Level III Patient-Centered Medical Homes through the

National Committee for Quality Assurance (NCQA) but felt they all could grow to become more effective Patient-Centered Medical Homes.

Each practice participated in a series of trainings by a TeamSTEPPS certified master trainer who is a physician specializing in diabetes care during a one year period. He met with each practice site (Medical Director, head nurse/lead medical assistant, practice manager) to plan the first session for the whole office team. Each session had some standard activities used in all sessions plus portions that fit each practice needs. The training needs were primarily defined by the medical assistants. This was followed by a two hour mandatory session for all staff. Each practice's staff completed the AHRQ Medical Office Survey on Patient Safety Culture at baseline, mid-way and at completion of training to determine perceived changes in team based care behavior and quality of care and the results of the survey was used as a teaching tool during the training sessions.

One of the most helpful tools during the study were the TeamSTEPPS training videos. The initial two hour session with the entire office team included a TeamSTEPPS video, a review of the survey results and some basics of TeamSTEPPS followed by small group breakouts. The video discussed the use of team huddles and a debrief process reviewing the effectiveness of the huddle. This session also included some didactic information about huddles and debriefs. Staff and clinicians split into small groups to discuss their response to the video. The small groups were led by medical assistants and physicians were encouraged to listen to staff concerns and suggestions for addressing the concerns. The leader and recorder for the small groups (always members of the staff) then presented what was discussed and recommended. Physicians and other clinicians were asked not to speak until the staff presented their information.

Three months after the initial session, the project leader/trainer met with the Medical Director, head nurse/MA and the practice manager of each practice to discuss what changes they noted and what they would like to discuss at the next two hour session. The breakout sessions and short videos vignettes were the most popular. The next two hour session was conducted similar to the

TABLE 1:

Physician Practice Characteristics

Practice Site	# of Physicians	Physician Extenders	Staff	Location Type	% Medicaid
A	3	3	19	Suburban	11%
B	4	5	25	Urban	38%
C	2	2	10	Suburban	7%
D	4	5	23	Urban	24%
E	3	2	12	Suburban	34%
F	1	1	7	Suburban	39%

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first one except the agenda was more staff directed. This session included a TeamSTEPPS video that illustrated a conflict between a staff member and a clinician. This session included some didactic information about conflict definition and resolution. In the last 10 minutes of the training session, the group was asked to evaluate the two-hour session by mentioning one item that was most effective and one item that would change in the teaching session. Following the teaching session, an on-line survey was sent to the attendees asking them to evaluate the session. Small group break-outs received the highest evaluation score because it gave attendees an opportunity to speak compared to the large group setting. Videos were popular because they brought the theory to life by demonstrating how huddles, debriefs and conflict were handled in a clinic setting by actors who portrayed real life situations.

Three months later the project trainer met with the three practice leaders to plan the next session. This session was completely controlled by office staff and clinicians with the trainer being an observer who shared positive aspects observed and suggestions for change.

In total, three team sessions were held with the master trainer with each practice. In addition to employee satisfaction data and monitoring improvements in team based care using the Medical Office Survey on Patient Safety Culture, all attendees offered suggestions on what they thought was effective and not effective. Every office now uses the TeamSTEPPS briefs, huddles and debriefs. Staff feel their opinions are more valued and they are willing to speak out to help solve office problems. Additionally, we asked each Medical Director, practice manager, and lead medical assistant at the end of the study to describe changes in office culture and systems. These best practices and common challenges were shared at a stakeholder meeting held in December 2016 and are provided below:

RESULTS

Best Practices Identified

Daily rounds. Medical Directors in the most successful offices began most days by arriving a few minutes early and walking the premises, greeting each staff member and provider. This practice gave the Medical Director an opportunity to take a pulse on their staff and the facility and assess for pending issues requiring attention. It also allowed the Medical Director to set the tone for the day with a positive hello to each staff member. One Medical Director mentioned that during the morning round in his office he saw one of his best team members crying. She just found out that her dog was hit by a car before work but came to work anyway. The Medical Director sent her home and the team reached out to her with a care package.

Daily huddles. Successful medical assistant-provider partnerships thrived with a daily huddle. The huddle is a small 3-5 minute meeting at the beginning of the day to review the upcoming schedule and anticipate workflow challenges. Patients were identified who would foreseeably need additional time, care, or review of outside medical records to ensure the appointment would be productive and efficient. One physician noted how this practice helped make his most challenging visits (transitional care visits and procedures)

more efficient.

Make team meetings more interactive. One office realized the staff felt passive and unengaged during team meetings. This office adjusted meetings to encourage staff involvement. When problems were identified, staff members were asked to present the problem to the group, offer potential solutions, and solicit peer input on creative resolution of issues. Group discussion was used to develop success measures. Staff then presented updates and success-related metrics at subsequent meetings. This office also decided to limit the number of issues addressed to one per division within the office, ensuring focused, thorough improvement of one process at a time. They saw a more unified front in attacking these issues. The staff at this office felt that the meetings were more meaningful to them and became passionate in becoming agents for solutions.

Institute a monthly lunch ritual. Two practices stood out. One office developed a “Lunch and Listen” in which they set aside dedicated time for the Medical Director and Office Manager and a small focus group of staff to hear current concerns and brainstorm solutions. The Medical Director and office manager would listen and acknowledge issues. This interaction leveled power differentials, and fostered comfortable conversation about the status of the workplace. A second office developed an event called “First Monday Lunch.” This evolution encouraged staff interaction during a communal lunch hour, and was typically pot-luck, with all participants contributing to the meal. Unlike the “Lunch and Listen,” however, discussion of work-related topics was specifically excluded. The office has noticed improved morale and cohesion of staff and providers because of this shared time. The staff felt like they really got to know their Medical Director whom they had worked with for years.

Shadow partners. A disconnect exists in many Family Medicine offices between clerical front office staff and clinical medical assistants. One office paired front office staff with their counterpart medical assistants for a day of job shadowing, to facilitate mutual understanding of job responsibilities and work flow. This exercise of “walking a day in someone else’s shoes” has fostered professional respect and workflow improvements between both office divisions. The staff has noticed that each position in the office has its challenges and are more likely to help pitch-in even when it is out of their normal job duties.

Develop protocols to clarify roles. A few of the offices in the study developed protocols for divisions within the office that were prone to disrupt patient throughput. Specific examples included creating late patient and no show policies, and building standing order sets medical assistants can use to support health maintenance activities. These protocols were recognized by the staff as helpful in alleviating the stress of making difficult decisions during challenging patient scenarios (i.e. how to handle the patient who shows up for their appointment 45 minutes late). The staff noticed having policies took the stress off them having to make decisions that may hurt the practice. The medical assistants who had standing protocols for health maintenance felt empowered by their ability to assist in addressing care gaps that they identified during a patient’s check in process.

Be willing to call brief “short informative meetings” when necessary to clarify operations. One clinic gracefully overcame an unforeseen challenge when an active alarm threatened disruption of patient care. Office procedures were rapidly aligned by the quick arrangement of a large group meeting. A second clinic exemplified this best practice when a rumor about clinic finances began to cause hard feelings amongst staff. The team came together and addressed the concern in a concise, straightforward manner, resulting in swift improvement in office climate and stifling propagation of misinformation at an early stage.

Set a few measurable overriding goals for the year. These clinics used quality outcome scores and online medical record patient portal sign-up rates as improvement goals for the year. Office staff members were made aware of the goal targets and input was requested from the staff to develop strategies for achievement. Periodic status updates were relayed to the staff to encourage continued focus on targets and to monitor success.

Give immediate positive group feedback for outstanding performers. Public sharing of praise boosted both group and individual morale and inspired others to perform well. Participating offices noted that this practice seemed to encourage employees who were not historically strong performers to sustain positive professional behaviors. Positive feedback was delivered through group e-mails and by verbally recognizing employees during staff meetings.

Debrief after major events. After unanticipated or critical events (e.g. an unstable patient in the office, disagreement among staff members), successful offices held an immediate debrief to discuss what went well and what could be improved. This practice strengthened teamwork by reinforcing roles and empowering members of the team to handle acute clinical scenarios.

Office leadership should be passionate team-builders. The clinic leader may be a physician or a non-physician, but must have a passion for leadership and team building to help the office reach its potential. There has to be a vision of what the clinic can and should be. It is essential that the leadership is able to translate the “why” of why the clinic does what they do. The staff and other providers need to understand what the underlying motivation of the office is. One office recognized how a steady approach from their Medical Director seemed to always be a stabilizing force when challenging times hit.

Common Challenges

Staff turnover. Staff turnover uniformly disrupted positive momentum. Daniel Pink described in his book *Drive* that fairly compensated workers experience job fulfillment when they are provided autonomy, mastery and purpose.⁶ Fulfilled staff, in turn, are less likely to seek other employment opportunities. One of the primary intended outcomes of improved office culture, therefore, is a decreased employee turnover and attrition rate.

The “poison pill.” Larger offices each identified at least one worker who was obstructive to building team culture and cohesiveness. Participating clinics each reported an inverse relationship between the influence of dysfunctional employees in the workplace and improved office culture: as team cohesiveness improved, negative effects of the dysfunctional employee were minimized.

All clinics realized that for challenging employees a written record needed to be kept of all interventions to help this employee succeed. If the situation needed to be escalated it was recommended to have HR assistance on the best way to help with extra training for these employees.

The whirlwind. Chris McChesney, Sean Covey and Jim Huling outline in “The Four Disciplines of Execution” describe the concept of the daily “whirlwind” fast-paced and complex day-to-day operations that prevent organizations from achieving process improvement goals.⁷ This constant influx of important but tiresome minutia hampers the ability of a group to address problems because routine tasks take precedent. This book suggests focusing on a “Wildly Important Goal” that supersedes, informs, and inspires the daily grind: a goal developed with group input, regularly assessed at office meetings, with defined metrics to evaluate for progress.

Teamwork requires diligent effort and inclusion of all members. Energy is required to maintain open communication and team unity. Team cohesiveness and enrichment isn’t a “set it and forget it” prospect. A spirit of constant striving toward team empowerment must be present to avoid lapses in communication. Leaders must be consistently engaged, constantly adjusting and seeking to optimize processes while facilitating buy-in of team members at all levels in order to develop an enthusiastic sense of purpose in the workplace.

Medical Office Survey Results

Each practice’s staff completed the AHRQ Medical Office Survey on Patient Safety Culture at baseline, midway and completion of training to determine perceived changes in team based care behavior and provision of quality care. This survey contains over 50 questions that address medical office personnel’s attitudes and beliefs as well as patient care practices. There were 90 people who participated in the medical office survey across 6 practices (26 clinicians, 61 staff, 3 unspecified) resulting in a response rate of 70%. Due to the length of time of the training (across 12-15 months), those who responded to the survey at the different time points may be different due to staffing changes. Some practices saw a significant improvement in certain areas, however, two of the practices had leadership turnover that affected morale and operations and was evident in the survey results for those practices.

The figures on page 16 include results from the first survey and the last survey (Survey 3) for all six practices for a few key questions. Figure 1 addresses the question of providers being open to staff ideas on how to improve office processes. There was nearly a 15% increase in the “Always” response from the first to the third survey. Figure 2 provides the results to the statement “Staff are afraid to ask questions when something does not seem right.” The “Never” category increased by over 9% while the “Most of the time” category decreased by over 9% from the first to the third survey. Figure 3 addresses how often the office staff discuss ways to prevent errors from happening again. There was a 6% increase in the “Always” response category and almost 5% decrease in the “Never or Rarely” categories. Figure 4 addresses changes in office practices in reminding patients when they need to schedule an appointment for preventive or routine care. There was a 10% increase in the “Always” response to this question. Figure 5 provides the results of

FIGURE 1:

Providers in this office are open to staff ideas about how to improve office processes

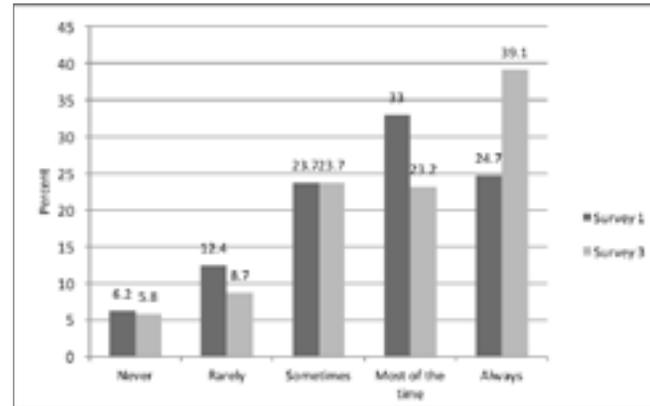


FIGURE 2:

Staff are afraid to ask questions when something does not seem right

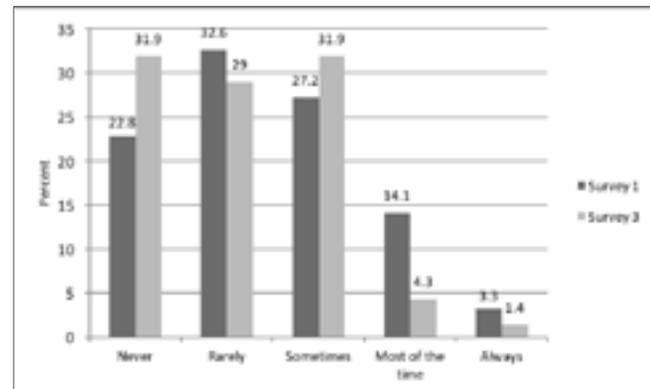


FIGURE 3:

In this office, we discuss ways to prevent errors from happening again

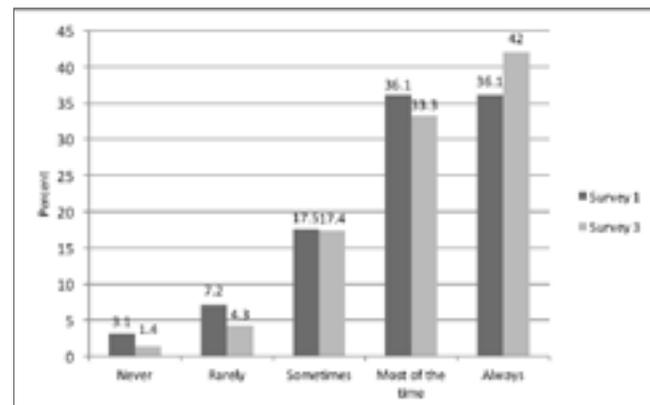


FIGURE 4:

This office reminds patient when they need to schedule an appointment for preventive or routine care

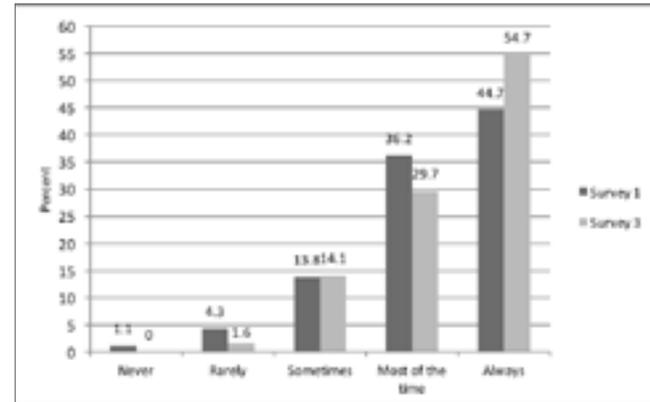
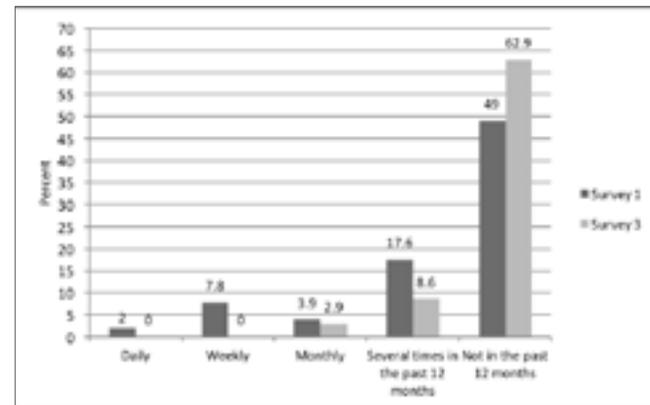


FIGURE 5:

A critical abnormal result from a lab or imaging test was not followed up within 1 business day



how critical abnormal test results were not followed up within 1 business day. There was almost a 14% increase in staff responding that this did not occur during the last 12 months and no daily or weekly occurrences of this problem were noted in the third survey

KEY FINDINGS/CONCLUSIONS

During the final stakeholder meeting, the one factor that separated successful office transformation in the course of this study was the presence of a service-oriented Medical Director or “servant leadership.” Servant Leadership is a concept coined by Robert Greenleaf in the late 1960’s. He writes of this leadership philosophy, “The difference manifests itself in the care taken by the servant - first to make sure that other people’s highest priority needs are being served. The best test, and difficult to administer, is: Do those served grow as persons? Do they, while being served, become healthier, wiser, freer, more autonomous, more likely themselves to become servants?”⁸

Visible Medical Director engagement and eager support for team building and optimization of office culture was noted as a primary contributor by the office team by the most successful participating practices. Conversely, Medical Director turnover, turmoil, or disengagement was a cited factor in the least successful test sites. Four of the six practices had a consistent Medical Director who was highly engaged during the study. The staff of these practices all shared how this made a major difference in changing the culture of the office. The staff members of the two practices who experienced turnover recognized how this limited their ability to make greater strides during this practice transformation process.

Overall, the TeamSTEPPS based training was found to be beneficial by all of the practices even though there were issues with staff and Medical Director turnover. The results of the Medical Office Survey provided insight on how the training improved staff confidence and morale. Staff felt more comfortable addressing issues with their physician leadership and feel that they are a valued member of the patient care team. This training also improved office practices with regards to addressing preventative care and improving critical communication with patients.

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REVIEW ARTICLE

Improving Diabetes Care Efficiency: Glucose Meter Download Station in Medical Offices

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Keywords: Diabetes, Endocrinology, Office Procedures, Blood Glucose

Diabetes mellitus has become a public health pandemic. Nearly 1 in 9 adults in the U.S. have diabetes. This is expected to grow to 1 in 3 Americans by 2030. Diabetes management is time consuming for both the patient and the physician. It is recommended that people with diabetes perform self-monitoring blood glucose (SMBG) as part of their disease management. The SMBG reports can help both the patient and the physician make adjustments to diabetes treatment. These handwritten reports are frequently cumbersome to interpret and therefore difficult to make meaningful suggestions. Improving the efficiency in clinical office procedures can enhance the diabetes management outcomes. One such example is the glucometer download station. This manuscript reviews the how, when, and where download stations can help improve diabetes practice.

INTRODUCTION

Despite advances in the knowledge of diabetes management and the advances in the treatment of diabetes it continues to be very challenging to manage. As there are more people with diabetes every year there is an increase in health care utilization and outpatient visits for these patients. While 1 in 9 Americans have diabetes today, it is projected to be 1 in 3 Americans by 2030.¹ In family medicine the physician treats most if not all of the patients' concerns and the increasing time needed for diabetes management has become a dilemma for the physician. It has been estimated that it takes 3 to 10 hours per day of physician time to manage chronic diseases.² The management of diabetes and its complications requires 4 diabetes-focused visits/patient/year. Improving the efficiency of these visits and enhancing pattern recognition to identify problems would shorten visit time and improve patient care. A glucose meter download station is one of those efficiency-enhancing mechanisms.

WHAT IS A DOWNLOAD STATION?

A download station is a clinic-equipped office space with the necessary tools to extract data directly from patients' glucometers when they present to the clinic for their medical appointments. Most information can be organized and reports generated according to the provider's preference. A download station can be easily set up in a typical office space (i.e. 6 feet x 6 feet) with a computer

and a printer as the main components. Designated a medical assistant's workstation can also function as a download station if it is equipped with the necessary software and hardware. The goal of a download station is to systematically generate a clear, pre-configured blood glucose report prior to the consultation, allowing providers to simplify their decision-making process.

WHY DO I NEED A DOWNLOAD STATION?

Successful management of diabetes mellitus greatly relies upon patients' self-care behaviors. Self-monitoring blood glucose (SMBG) has become the standard of care in effective management of diabetes therapy.³ SMBG allows patients to better evaluate their individual responses to medications, dietary modifications, and physical activities with the aim to prevent hypoglycemia and make appropriate decisions on bolus insulin dosages (correlation scale and food coverage). Along with hemoglobin A1c, fasting and 2 hour post meal readings can help providers to safely and effectively manage diabetes, e.g., fasting and 2-hour post-prandial readings.

Most patients are encouraged to perform SMBG and to record their glucose readings in a logbook along with their daily food intake and exercise regimen; the frequency of monitoring depends on a particular patient's diabetes pharmacotherapy. However, these self-monitoring blood glucose logbooks are often not brought to the clinic for evaluation, or they may not accurately reflect the true readings from their glucometers.⁴ In addition, it is not uncommon for patients to produce or report only the "good" values when asked to document the readings on a logbook.⁵ Some patients will change their diets a few days prior to their next office visit with

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their clinicians, allowing the reported blood glucose values to appear more acceptable than they normally are. To circumvent these potential discrepancies, retrieving the glucose data directly from the glucometer may provide a more comprehensive understanding of the glucose trend from the patient between office visits.

Similarly, patients may present to the office visit with Continuous Glucose Monitors (CGM). CGM continuously records the patient's glucose level every 5 to 15 minutes for a course of 3 to 7 days. In contrast to SMBG, which provides a single real-time glucose level, CGM provides complete glucose level information over a few days. The data recorded can be downloaded and analyzed with the use of a corresponding diabetes management system, and the additional information can further assist clinicians in making individualized-care and therapeutic-treatment recommendations.⁶ CGM is particularly recommended for patients with repeated hypoglycemia, hypoglycemia unawareness and those whose diabetes goals are not achieved with SMBG.⁷ Likewise, many insulin pumps available on the market are able to receive information from the sensor through the transmitter and are also able to store the patient's CGM glucose levels. Hence, this paper aims to provide clinicians with more information on the technical details with regards to setting up glucose reading download station for the major products currently available in the market.

WHAT ARE THE NECESSARY SOFTWARE & HARDWARE NEEDED FOR THE DOWNLOAD STATION?

Various brands of glucose meters and insulin pumps, which patients could bring in with them to the clinic, are currently available on the market. The first step is to install the meters software onto the computer the medical team will use for downloading. Essentially, all of the meters have software, and data can be downloaded to a PC/Windows. Many are also compatible with MAC, especially if the MAC has Windows compatibility. Next, most of the meters come with a Universal Serial Bus (USB) cable that allows the team to connect the meter to the software on the computer. Some companies will supply the cords to the practices (i.e. Abbott CoPilot Health Management System version 4.2.1 for FreeStyle® Lite glucose meters), while other meters come with a cable for patient home downloading as well. Some meters are able to Bluetooth to a smart device. Software and hardware requirements for major blood glucose meters marketed in the U.S. are detailed in Tables 1 - 6 (pages 20-22), and requirements for insulin pumps and continuous glucose monitors (CGM) are listed in Table 7 (page 24).

Steps to initiate the data download process:

1. Double-click on the appropriate desktop icon to initiate the health management system software.
2. Firmly connect the appropriate cable to the computer on one end and connect the other end to the device's data port.
3. Search and locate the patient's profile to which the data to be downloaded; for new patients, a new profile will need to be created.
4. To begin data transfer, most meters need to be turned off. If communication is not established between the computer and the device, turn on the meter.

ARE THERE ANY PROBLEMS WITH THE SYSTEMS?

Several issues have been identified. Some meters will not properly download if the time and date are not accurate. They may yield a blank report even though the meter clearly has readings. The download will only have the glucose readings the person actually performed. Some patients may be less likely to check their glucose at extremes of glucose and will treat based on their symptoms. This will result in an under-representation of those extreme values. Despite not recommended by manufacturers, some patients would still share their glucose meters with their family members, thus healthcare providers should not download data from any devices that have data stored for more than one person. Each device is linked to its user so it allows you to collect data from many patients but not confuse the data.

ARE THERE ANY UNIVERSAL DOWNLOAD SYSTEMS?

If you have a busy practice and have patients from many different insurers (who doesn't), having many different download stations becomes a problem since each of the meters has their own software and downloading capacities. One way to handle this is to utilize those meters that are most represented in your practice. However, what many providers long for is a universal platform to download devices.

Several health management systems are working on being compatible with other devices from different manufacturers. There are three companies that have "universal" platforms for both patients and providers. Examples of these systems include Diasend, Glooko, and Tidepool. These programs have the advantage of providing a single standardized report. However, some may require a subscription.

Diasend is a universal platform that enables providers to connect blood glucose meters, continuous glucose monitors, and insulin pumps to a single piece of mobile-enabled hardware. Data are uploaded online, so no software is needed on office computers. The Diasend system has over 100 compatible devices and consolidates the information into a structured web-based report; no matter what the device is or how the data are stored. This system also has a personal model that allows patients to download at home, print off their reports, and then bring them to the office to share with their providers.

Glooko: MeterSync Blue system enables patients to upload data via Bluetooth from over 30 glucose meters to Android and Apple apps. When a patient or provider wants to download data, they simply plug MeterSync Blue adapter into their meter, and results are sent wirelessly to the app. The MeterSync Blue adapter can be left plugged in continuously which essentially transforms those meters into 24/7 Bluetooth-enabled device. This device is not currently compatible with insulin pumps. This system also requires a subscription. We recommend that the patient buy the subscription at \$59.95 per year and then download their meter at home and bring in the reports.

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TABLE 1:

Abbot Freestyle® Glucose Meters

Glucose Meters					
FreeStyle® Lite	FreeStyle® Freedom Lite	FreeStyle® InsuLinx	FreeStyle® Precision Neo	FreeStyle® Precision Xtra	
Connection Cable	USB to 2.5mm stereo	USB to 2.5mm stereo	Micro USB	Mirco USB	USB with Strip Port
Other compatible meter(s)	FreeStyle® Freedom				
FreeStyle® Auto-Assist	Supported	Supported	Supported	-	Supported
FreeStyle® LibreView™	Supported				
Software Requirements	FreeStyle CoPilot Health anagement System version 4.2.1 Adobe® Acrobat or Adobe® Reader		Microsoft® Windows® XP, Vista, or 7 Web Browser: - Internet Explorer 10+ - Microsoft Edge - Google Chrome release 37.0+ - Mozilla Firefox release 32.0+		
Hardware Requirements	2 GB free disk space or greater Display with a minimum screen resolution of 1024 x 768 pixels Internet connection (if using internet download installation) CD-ROM (optional unless installing from disk) Intel® Pentium® 3 processor 550MHz equivalent or higher		512 MB RAM or greater Mouse/Trackball Keyboard 1 free USB port Black and white or color printer		
	For Mac OS® X Mountain Lion or higher Web Browser: - Safari (View-only; upload utility is not supported)				

TABLE 2:

Bayer Healthcare Contour® Glucose Meters

Glucose Meters					
Contour®	BREEZE® 2	Contour® LINK	Contour® NEXT	Contour® NEXT EZ	
Connection Cable	USB to 3.5mm stereo			Mirco USB	USB to 3.5mm stereo
Other compatible meter(s)	Contour® USB / Contour® NEXT USB / Contour® NEXT LINK				
Software Requirements	GLUCOFACTS® DELUXE Diabetes Management Software version 3.10.08 Adobe® Acrobat or Adobe® Reader		Mac OS® Operating System(s): - Leopard, Snow Leopard, Lion, Mountain Lion, Mavericks, Yosemite, or El Capitan		
Hardware Requirements	2 GB free disk space or greater Graphics card that supports 1024 x 768 or higher Display with a minimum screen resolution of 1024 x 768 pixels Internet connection (if using internet download installation) CD-ROM (optional unless installing from disk)		Mouse/Trackball Keyboard 1 free USB port Black and white or color printer		
	Microsoft® Windows® Operating System(s): - XP (SP3), Vista (SP2), 7, 8, or 10				

TABLE 3:

Lifescan OneTouch® Glucose Meters

Glucose Meters					
OneTouch Ultra® 2	OneTouch UltraMini®	Verio®	Verio® Flex System	Verio® IQ	
Connection Cable	USB to 3.5mm stereo	USB to 3.5mm stereo	Micro USB	Mirco USB	Mini USB
OneTouch Reveal® Mobile Application	-	-	-	Supported	-
OneTouch Reveal® Web Application	Supported				
Software Requirements	OneTouch Reveal® Data Transfer Tool Adobe® Acrobat or Adobe® Reader 10+ For Mac OS® Web Browser: - Mozilla Firefox® 11+ - Safari® 7+		Microsoft® Windows® XP, Vista, or 7 Web Browser: - Mozilla Firefox® 11+ - Google Chrome™ 17+ - Internet Explorer® 9+ - Microsoft Edge®		
Hardware Requirements	Microsoft® Windows® 7, 8.1, or 10 Mac OS® X 10.9, 10.10, 10.11 Internet Connction Black and white or color printer		Display with a minimum screen resolution of 1024 x 768 pixels Connection cables for other supported devices, please refer to: www.onetouchreveal.com/support/en_US/		

TABLE 4:

Nipro Diagnostics TRUEtrack® Glucose Meters

Glucose Meters					
TRUE METRIX®	TRUEresult®	TRUEtrack®	TRUEbalance™	TRUEread®	
Connection Cable	-	-	USB to 3.5mm stereo	USB to 3.5mm stereo	USB to 3.5mm stereo
Docking Station	Supported	Supported	Supported	-	-
Software Requirements	TRUEmanager® Diabetes Management Software Adobe® Acrobat or Adobe® Reader Microsoft® Windows® XP, Vista, or 7				
Hardware Requirements	1 GB of RAM or greater 2 GB free disk space or greater 1 free USB 2.0/3.0 port USB cable and/or docking station Mouse/Trackball Keyboard		Intel® Pentium® 4 processor 2GHz equivalent or higher Internet connectivity (if using internet download installation) CD-ROM (optional unless installing from disk) Graphics card that supports 1024 x 768 or higher Display with a minimum screen resolution of 1024 x 768 pixels Black and white or color printer		

TABLE 5:

Roche Diagnostics Accu-Chek® Glucose Meters

Glucose Meters	 Accu-Chek® Nano	 Accu-Chek® Aviva	 Accu-Chek® Aviva Expert	 Accu-Chek® Compact Plus
Connection Cable	USB / Infrared (IR)	USB / Infrared (IR)	USB / Infrared (IR)	USB / Infrared (IR)
Other compatible meter(s)	Accu-Chek® Compact Accu-Chek® Active Accu-Chek® Combo System	Accu-Chek® Spirit Insulin Pump Accu-Chek® Smart Pix Reader Accu-Chek® Go	Accu-Chek® D-TRONplus Accu-Chek® Aviva Connect	
Web-based Applications	Accu-Chek® Connect Online Diabetes Management System			
Software Requirements	Accu-Chek 360° Diabetes Management System Adobe® Acrobat or Adobe® Reader		Microsoft® Windows® XP (SP3), Vista, 7, 8 or 10 Web Browser: - Internet Explorer 9+ - Microsoft Edge 25+ - Firefox 45+ - Google Chrome 49+	
Hardware Requirements	Intel® Pentium® processor 1 GHz equivalent or faster Display with a minimum screen resolution of 1024 x 768 pixels 5 GB free disk space or greater 512 MB of memory or greater Mouse/Trackball		Keyboard 1 free USB port CD-ROM Black and white or color printer	

TABLE 6:

ARK Care™ ReliON® glucose meters

Glucose Meters	 ReliON® Prime	 ReliON® Confirm	 ReliON® Micro	 ReliON® Ultima
Connection Cable	USB to 3.5mm stereo	USB to 3.5mm stereo	-	-
Other compatible meter(s)	GLUCOCARD® Expression GLUCOCARD® Vital	GLUCOCARD® 01 GLUCOCARD® Shine		
Web-based Applications	Supported	Supported	-	-
Software Requirements	ARK Care® Real-Time Diabetes Management System Microsoft® Windows® 7, 8, or 10 Internet Explorer 10+			
Hardware Requirements	1 free USB port CD-ROM Internet connection	Mouse/Trackball Keyboard		Display monitor Black and white or color printer

Tidepool takes data from most glucose meters, continuous glucose sensors, and insulin pumps and then consolidates that data into a single consolidated report. Tidepool is also working to develop the Tidepool Uploader, a web-based software that will connect with multiple devices and upload the data, eliminating the need for unique software for every single device. Tidepool is a 501c3 non-profit entity that intends to offer its software for free to patients and providers.

WHAT DO THE REPORTS LOOK LIKE?

Examples of what these downloaded results would look like can be seen on pages 26 - 28.

HOW DO I GET MY PATIENTS TO ENGAGE IN THIS TECHNOLOGY?

Printing the reports off to show patients is very helpful. They can see what you see and you can discuss the patterns that can help them. Often noted can be written on these pages to provide reminders and instruction for treatment modifications. This reinforces the importance of SMBG. Finally as patients become advanced we ask them to look at their trends and make adjustments even between visits. While only a few become this advanced it is a pleasure to see when patients can maximize disease self management.

CONCLUSIONS:

In order to obtain a useful blood glucose report at every office visit to guide diabetes management, the health care team will need to help patients integrate self-monitor blood glucose into their daily routines. A suggestion would be to remind patients to set alarms or reminders on their smartphones to include blood glucose monitoring as part of the treatment plan. Further troubleshooting with patients to overcome barriers on checking blood glucose levels at home is instrumental in empowering these patients to help them take charge of their disease. The SMBG data is for them not just for the physician. This is one of the many ways to encourage and empower patients to take control of their diabetes.

Educating patients on interpreting their own blood glucose trends on the reports is equally important, as some patients will need the information for insulin self-titration. In addition, from a safety standpoint, patients can self-identify low blood glucose readings and/or trends of hypoglycemia influenced by their diabetes regimens, fully utilizing the data gathered on a daily basis.

Key Recommendations:

1. Diabetes management takes time and efforts, so we should utilize practice efficiencies whenever possible.
2. A glucose meter download station is free and can save you tremendous amount of time.
3. Glucose meter downloads will organize data to allow you quickly see: how often the patients are checking their blood glucose levels, are experiencing severe hyperglycemia or hypoglycemia, and what the current glucose patterns are.
4. Ultimately, glucose meter downloads are intended to be helpful for patient self management. You can use glucose downloads as a patient education tool to enhance the existing tools that you have already shared with your patients to empower them taking control of their diabetes.

REFERENCES:

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7. Blevins TC. Professional continuous glucose monitoring in clinical practice 2010. *J Diabetes Sci Technol*. 2010;4(2):440-456.

TABLE 7:

Insulin pump / Continuous Glucose Monitor (CGM)

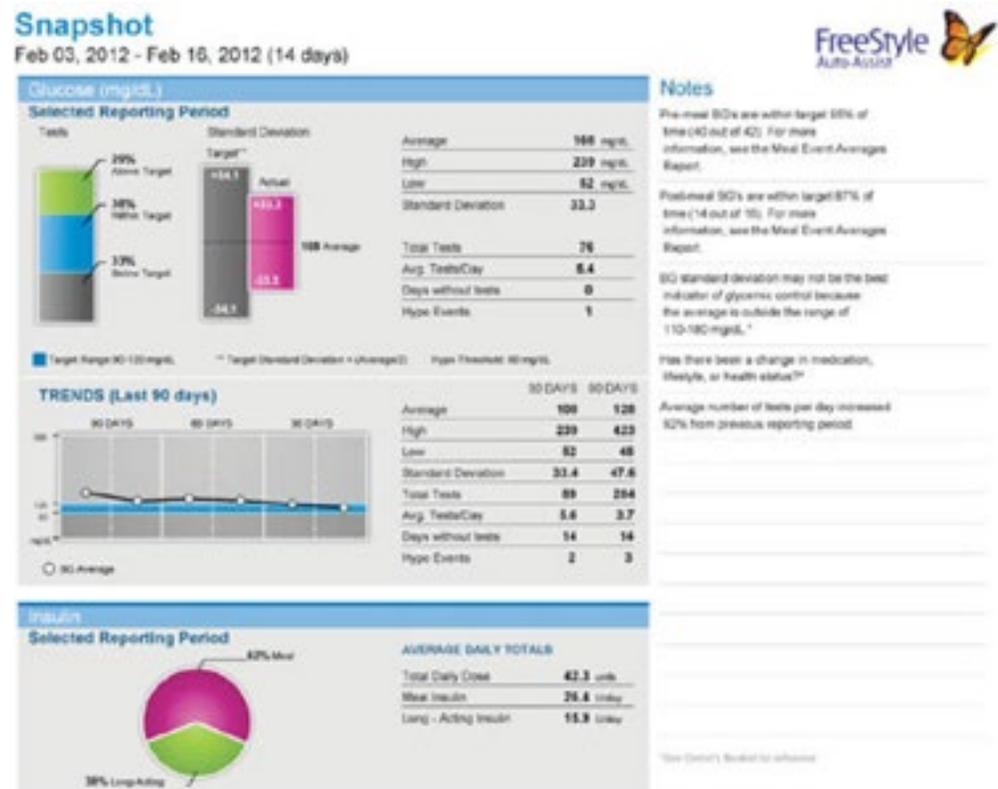
Manufacturer	Abbott Diabetes Care	Animas Corporation	Dexcom	Insulet Corporation	Medtronic	Roche Diagnostics	Tandem Diabetes Care
Insulin pump / CGM	FreeStyle® Libre Pro	Animas® Vibe OneTouch Ping®	Dexcom G4® Platinum Dexcom G5® Mobile	OmniPod® + PDM Omnipod® + Dexcom G4	MiniMed® 530G + Enlite MiniMed® 630G + Enlite MiniMed® Paradigm® REAL-Time Revel™ MiniMed® 670G + Guardian® sensor 3	Accu-Chek® Combo system Accu-Chek® Spirit insulin pump	t:flex® Insulin Pump t:slim X2™ Insulin Pump t:slim G4™ Insulin Pump
Connection Cable	Micro USB	USB / Infrared (IR)	Micro USB	Mini USB	CareLink USB or Contour® NEXT LINK	USB / Infrared (IR)	Micro USB
Software Requirements	FreeStyle® Libre Pro Reporting Software Windows® 7, 8, 10 Mac OS X (El Capitan) (Refer to table 2)	Operating System: Microsoft® Windows® XP or later Mac® OS X 10.6.8 or later	Dexcom® STUDIO Software to open .doc files Software to open Excel files Adobe® Acrobat or Adobe® Reader Mac® OS X 10.8+ Web Browser: - Safari 6+ - Google Chrome - Mozilla Firefox Microsoft® Windows® XP (SP3), Vista (SP2), 7 (SP1), 8, 10 Web Browser: - Internet Explorer 9+ - Microsoft Edge - Google Chrome - Mozilla Firefox	FreeStyle® CoPilot Health Management System (Refer to Table 1) Adobe® Acrobat or Adobe® Reader PC or Mac® Web Browser: - Internet Explorer - Safari	CareLink® Pro Therapy Management Adobe® Acrobat or Adobe® Reader Microsoft® Windows® 7, 8, or 10 Mac® OS 10.5+ Web Browser: - Internet Explorer 10+ - Mozilla Firefox 38+ - Safari 4+	Accu-Chek 360° Diabetes Management System (Refer to Table 5)	Operating System: Mac® OS X® Mountain Lion, Mavericks, or Yosemite Microsoft® Windows® XP, Vista, 7, or 8; Web Browser: - Google Chrome 15.0+ - Mozilla Firefox 7.0+ - Safari 5.1+
Other Compatible Systems	Major Glucose Monitors from: Abbott Bayer Lifescan Roche	Major BG meters and CGMs*	Dexcom G4® CGM System Dexcom G5® CGM System	OmniPod® + PDM only† Major BG meters, insulin pumps, and CGMs‡	Major BG Meters and Insulin Pumps^	(Refer to Table 5)	BG Meters: OneTouch® Verio® IQ OneTouch® UltraMini OneTouch® Ultra2 Accu-Chek® Aviva Accu-Chek® Compact Plus FreeStyle® Lite FreeStyle® Freedom Lite
Web-Based Applications* † ‡	LibreView® Diasend® Web application	Diasend® Web application Tidepool® Uploader	Dexcom® CLARITY Diasend® Web Application Glooko Web App Tidepool® Uploader	Diasend® Web application Glooko Web App Tidepool® Uploader	CareLink® Personal Therapy Management Glooko Web App	Accu-Chek® Online Diabetes Management System Diasend® Web application	t:connect® Diabetes Management Application Diasend® Web application Tidepool® Uploader
Hardware Requirements (Additional to basic computer setup)	Dual-core 1.6GHz processor or faster 2 GB RAM or higher 1 free USB port Internet connectivity (for internet download installation) (Refer to Table 2)	Internet connectivity USB cables for BG meters (if planned to upload information from meter)	1 free USB port CD-ROM (if installed from CD) Internet connectivity Windows® OS: 1.3 GHz processor equivalent or greater 1 GB RAM 100 MB free disk space Mac® OS: 2.3 GHz processor equivalent or greater 4 GB RAM 100 MB free disk space	Internet connectivity 1 free USB port USB cables for BG meters, insulin pumps, or CGMs USB Hub for Mac® OS X El Capitan (Refer to Table 1)	Internet connectivity 1 free USB port USB cables for BG meters or insulin pumps	(Refer to Table 5)	x86 compatible 1.6 GHz processor or faster Internet connectivity (for internet download installation) 1 GB RAM 1 GB free disk space 1 free USB port

PDM = Personal Diabetes Manager

† = For OmniPod® + Dexcom G4, please refer to information listed for Dexcom in table 6.

‡ = For more information on complete list of compatible devices, please refer to <https://www.glooko.com/compatibility>* = For more information on complete list of compatible devices, please refer to <https://www.diasend.com/us/patient>^ = For more information on complete list of compatible devices, please refer to <https://www.medtronicdiabetes.com/download-library>¥ = For more information on complete list of compatible devices, please refer to <http://tidepool.org/products/tidepool-uploader/#devices>

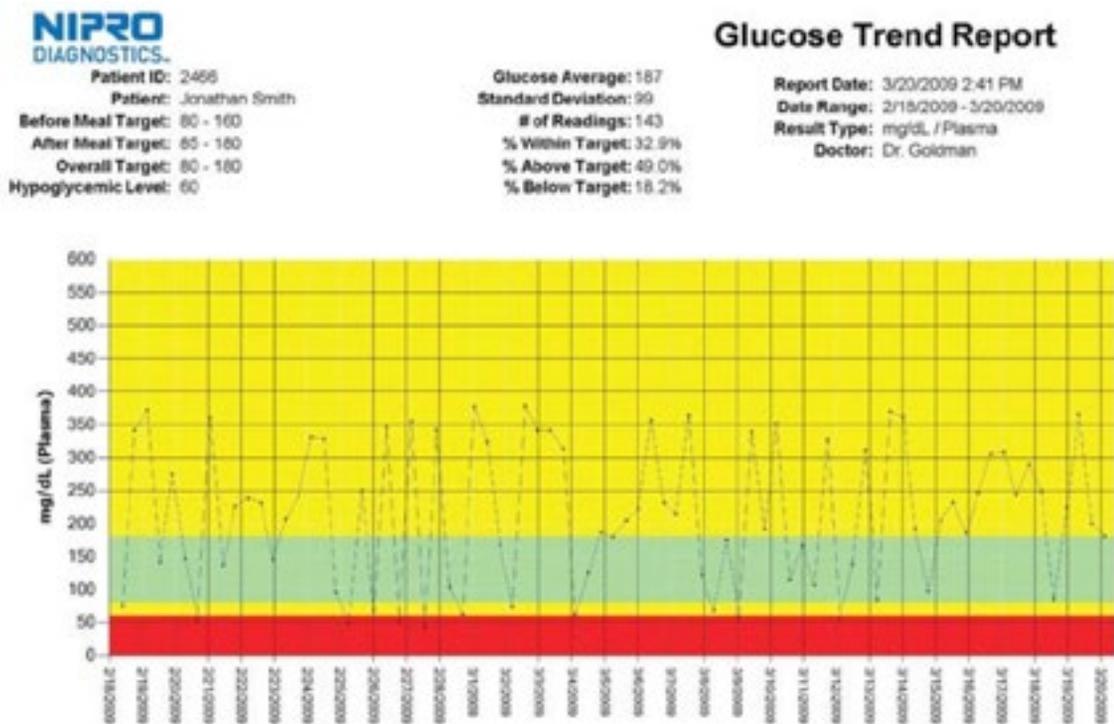
FREESTYLE AUTO ASSIST:



DIASEND:



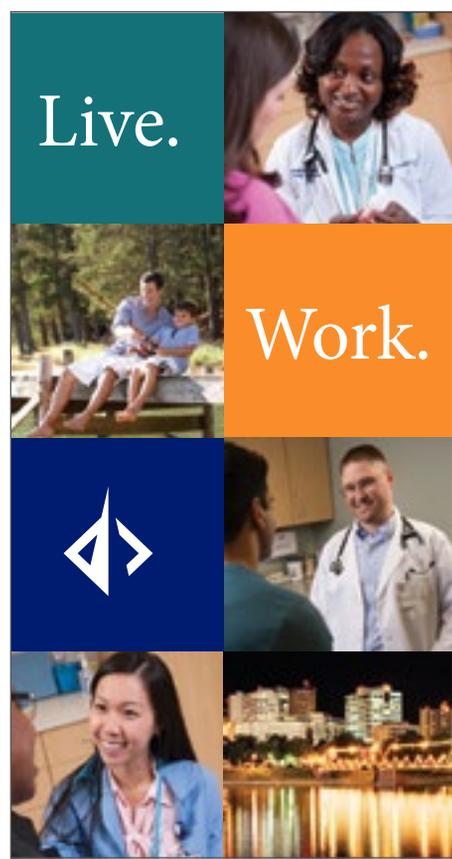
TRUEMANAGER:



TIDEPOL:



GLOOKO:



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REVIEW ARTICLE

An Osteopathic, Non Pharmacologic Approach to Parkinson's Disease, Restless Leg Syndrome & Essential Tremor

Matthew S. Goldfinger, OMS III, Shannon Moriarty, OMS III, Kristina DelPlato, BS, Sheldon C. Yao, DO, Adena Leder, DO, & Jayme D. Mancini PhD, DO

New York Institute of Technology College of Osteopathic Medicine

Keywords:	
Osteopathic Manipulative Medicine	Movement disorders are a heterogeneous group of complex sensorimotor neurological conditions involving involuntary abnormal movements, deficiencies or changes in normal motion. Parkinson's disease, restless leg syndrome, and essential tremor are the most common movement disorders, and their prevalence is increasing with the growth of the aging population. These neurological conditions affect multiple body systems and are best managed with a multifaceted treatment approach. Behavioral, lifestyle, and/or psychosocial modifications and treatments for sleep, mood, exercise, and nutrition to meet the increased metabolic demands are critical. Evidence suggests that osteopathic manipulative medicine may improve gait and motor function in Parkinson's disease as well as quality of life in restless leg syndrome. In addition, osteopathic manipulative medicine may be used to treat many of the common symptoms in these patients such as constipation, rib dysfunction, back pain, and tendonopathy in the same way as in patients without movement disorders. The normalization of autonomic nervous system function through manipulation of the suboccipital area, cervical myofascia, and rib raising would be particularly beneficial in these disorders. Integration of the five models of osteopathic care by the family physician can improve symptom management and overall quality of life.
Osteopathic Manipulative Treatment	
Movement Disorder	
Parkinson's Disease	
Restless Leg Disorder	
Essential Tremor	
Neurology	

INTRODUCTION

Movement disorders are a heterogeneous group of complex sensorimotor neurological conditions that are classified as having either a general increase in movement, hyperkinetic, or a paucity of movement, hypokinetic. The frequency of most movement disorders tends to increase with age. With the increasing size of the elderly population, the prevalence of most movement disorders is expected to double by the year 2050.¹ Movement disorders that are routinely seen in a primary care setting include Parkinson's disease (PD), restless leg syndrome (RLS), and essential tremor (ET). Each of these conditions can negatively impact a patient's quality of life. Early diagnosis by osteopathic family physicians and education regarding treatment options may improve care, particularly in the awareness of the early symptoms that are often not attributed to a neurological disorder and their osteopathic treatment. Integration of osteopathic manipulative medicine (OMM) provides patients an adjunctive, non-invasive treatment option which may improve symptoms and quality of life.

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The central tenets of osteopathic medicine provide a framework for utilizing osteopathic diagnosis and manipulative techniques to improve our patients' natural physiologic functions. Conditions involving decreased joint range of motion or musculoskeletal pain are often manageable by techniques which improve mobility or reduce excessive muscle tone. Similarly, an infectious process of the lower respiratory tract may benefit from increased mobility of the thoracic cage and improved lymphatic flow.^{2,3} The purpose of this article is to guide the family physician in an osteopathic approach to the care of PD, RLS and ET in addition to pharmacologic therapy.

THE FIVE MODELS OF OSTEOPATHIC TREATMENT

The five models of osteopathic care provide physicians with a framework to integrate osteopathic manual treatments (OMT) for PD, RLS, and ET. Application of direct active techniques can be helpful in engaging the patients' musculoskeletal system. Indirect passive techniques should be applied if the patient is too fatigued, unable to follow commands, or direct techniques are too painful to perform. The models may also aid the physician in providing patient education regarding goals of treatment and potential side effects prior to consent. The particular osteopathic techniques are outlined to the right. Osteopathic neuromusculoskeletal treatments may ease pain, provide symptomatic relief, and decrease the need for higher-risk medications or invasive procedures.

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BIOMECHANICAL MODEL

The biomechanical model looks at the body as interconnected levers, pulleys, compression, and tension elements to address somatic dysfunctions of the musculoskeletal system. The hyperkinetic and hypokinetic control of movements frequently impacts the musculoskeletal system and connective tissues. Goals of OMT in this domain include restoring normal muscle tone, joint range of motion, natural alignment, and decreasing nociception from synovial joint distortion.

NEUROLOGICAL MODEL

The neurological model addresses sensorimotor and autonomic nervous system (ANS) control of the body by both the central and peripheral nervous systems, all of which are pertinent to PD, RLS, and ET. OMT for the nervous system relies on inherent reflexes, and it can be applied at the end muscle/organ or centrally at the spine or head. OMT to normalize ANS tone may decrease the need for pharmaceutical interventions.

RESPIRATORY-CIRCULATORY MODEL

The respiratory-circulatory model focuses on the proper motion of intra- and extravascular fluid around the body as well as optimizing breathing. The focus of OMT is on cardiovascular and pulmonary health, flow of blood and lymph, and motion of the associated musculoskeletal structures. The major musculoskeletal structures facilitating pulmonary ventilation are the diaphragm, ribs and spine. These and the lower leg muscles also facilitate blood and lymph circulation. Improved lymphatic flow decreases local pooling of inflammatory mediators and metabolic waste products. These factors may play roles in the etiology and/or progression of PD and RLS. Decreasing edema tends to improve pain. Improvement in tissue perfusion may aid in supporting the excess cellular respiration demands. In conditions that disrupt sleep, PD and RLS, improving respiration may reduce nighttime awakenings, muscular pain in the morning, and daytime somnolence.

METABOLIC-ENERGY MODEL

The metabolic-energy model takes into account the biochemical, potential and kinetic energy dynamics aspects of physiology. The main goal of this model is to improve energy production and metabolic efficiency. Daytime fatigue is frequently problematic in RLS and PD. Changes in neuromuscular physiology may prevent efficient coordination of concentric and eccentric muscle contraction and passive stretch and relaxation. This decreased efficiency may cost the body more energy production than in healthy movement control. Along with the increased energy demands, the metabolic energy balance in movement disorders is often worsened by nutritional deficits such as Vitamin B12, magnesium and iron deficiencies. It is imperative to obtain sufficient nutrients to meet the increased metabolic demands of disease states while avoiding excessive consumption, which itself can also exacerbate disease.

BEHAVIORAL MODEL

The behavioral model addresses the complex cognitive, emotional, behavioral, and habitual aspects of disease and health. This model seeks treatment through building rapport, sharing information and resources, lifestyle modification, counseling, and/or cognitive behavioral therapy. All neuropsychiatric disorders are exacerbated by stress, and stress has been shown to worsen outcomes in many

chronic diseases. It is important to counsel patients and their family on behavioral interventions to decrease the stressful impact of chronic diseases.

METHODS

PubMed and Google Scholar databases were searched for guidelines in the diagnosis and treatment of PD, RLS, and ET. The secondary texts *An Osteopathic Approach to Diagnosis and Treatment*, *Foundations of Osteopathic Medicine* and *Atlas of Osteopathic Techniques* and primary research articles on multidisciplinary and osteopathic care for PD, RLS, and ET as well as their most common symptoms (tremor, constipation, mood disorders, daytime fatigue and somnolence, mobility, and pain) were reviewed. The most recent literature on these topics was selected for review. The information was evaluated utilizing concepts from Grading of Recommendations Assessment, Development and Evaluation (GRADE) as well as the authors' experience from a clinical and research perspective on treating people with these neurological conditions.⁴ Concepts from GRADE utilized in the selection of key references included outcomes of interest being important to patients, greater benefit than risk, and relation to the target audience of providers. OMT modalities were chosen based on clinical research and clinical experience from practicing physicians who treat these disorders.

PARKINSON'S DISEASE

Parkinson's disease is a neurodegenerative disorder that affects millions of people worldwide. There are approximately 1 million people in the United States living with PD, and over 60,000 new cases are diagnosed each year.⁵ Research suggests that PD is associated with a variety of external risks factors, including head trauma, exposure to pesticides, drug use, and others (Table 1).⁵ Emerging theories implicate breakdown of the blood brain barrier in many of these etiologies.⁶ Less than 30% of PD cases are associated with a genetic susceptibility.^{5,7,8}

Parkinson's disease is a hypokinetic movement disorder currently diagnosed clinically by its characteristic motor features of bradykinesia including decreased facial expression, rigidity of the musculoskeletal system, postural instability, and sometimes tremor (Table 2). Non-motor symptoms may be the initial presentation of the disease. Some common non-motor symptoms include loss of smell (anosmia), REM sleep behavior disorder, constipation, mood disorders, or autonomic nervous system (ANS) dysregulation of other organ systems (neurogenic disorders).⁹

Currently, the primary treatment goal is to improve quality of life by decreasing symptoms using both pharmacological and non-pharmacological approaches. Not all patients with PD are responsive to levodopa therapy, which increases the importance of having multiple management options. Research is being conducted on non-pharmacological rehabilitative approaches such as OMM, physical activity, social activity programs and support groups.¹⁰

BIOMECHANICAL

Techniques such as muscle energy, articular, counterstrain and myofascial release can improve range of motion, decrease pain and stiffness. In PD, OMM can target the motor features bradykinesia, rigidity, and "shuffling" gait. Goals of OMT following the biomechanical model are to decrease pain, increase the range of motion of rigid joints, and improve posture, gait, and balance. One study

demonstrated that OMT using muscle energy (ME) and passive articulatory techniques significantly improved stride length, limb velocity and upper extremity swing.¹⁰ This study was limited due to the blinding process. The experimental design was non-uniform in that in the control group, participants received sham OMT without self-care pointers and in the active group participants received actual OMT with self-care pointers. Due to the continuation of treatment through self-care only in the active group, the researcher cannot know how much this contributed to the results. However, patients seeking help through OMT will most likely receive self-care techniques. A randomized, controlled trial demonstrated that a similar OMT protocol performed twice a week for six weeks significantly improved motor function in PD subjects compared to controls receiving counseling on PD-related topics, including mobility and nutrition, as measured by the Movement Disorder Society - Unified Parkinson's Disease Rating Scale (MDS-UPDRS) without changes in medications.¹¹ This study was limited in that there were a small number of participants. The active group was not uniform in results; some subjects had a dramatic improvement while one had less improvement and possibility of psychosomatic effect. However, considering the low risk of the OMT protocol in this population and patient and caregiver concern regarding motor function and the characteristic "shuffling" gait, the evidence highly supports that regular OMT using this protocol is recommended as a non-invasive approach. In PD there is also a five-fold increased risk of postural change which can result in marked pain and increased risk of falls.¹² OMT directed at the axial spine and connecting muscles to the extremities can potentially help to address camptocormia and other postural disorders. With RLS, ET, and PD resting tremor, there is excessive motor endplate stimulation which may yield an increase in resting muscle tone, muscle soreness or a chronic somatic dysfunction in the affected limbs similar to 'overuse' tendinopathy.

NEUROLOGICAL

In addition to the motor features of PD, there are non-motor features including dysregulation by the ANS, which can manifest as gastrointestinal dysmotility, shortness of breath, fatigue, and possibly decreased heart rate variability.^{13, 14} OMT to normalize function is applied to the central nervous system, nerves, or ganglia of the ANS. Rib raising decreases molecular and physiological markers of sympathetic drive.¹⁵ Research suggests that OMT to the suboccipital region affects the parasympathetic nervous system through the vagus nerve demonstrated by heart rate variability changes after suboccipital release and cervical myofascial techniques.¹⁶ A proposed mechanism by which cranial OMM may improve central ANS and sensorimotor function is to improve lymph flow and venous drainage through the dural sinuses to decrease local toxin buildup.¹⁷

RESPIRATORY-CIRCULATORY

A clear link exists between PD and respiratory dysfunction. Patients often display a restrictive breathing pattern on pulmonary function testing. This may be multifactorial, including decreased respiratory drive associated with bradykinesia and hesitation, or trouble initiating motion, decreased thoracic excursion attributable to rigidity, and muscle spasms when forward-bending truncal dystonia (camptocormia) is present. In turn, the decreased thoracic excursion diminishes the intrathoracic pressure changes required

for pulmonary ventilation and pumping of major lymphatic and afferent vessels. There is also an increased risk of cardiovascular disease in PD. Proposed mechanisms for this relationship includes dysautonomia and increased time spent sedentary.^{13, 18} Among those immobilized by advanced disease, there is an increased risk of venous stasis with inability to clear inflammatory mediators and clotting that may be addressed with OMT. Techniques used in this model include muscle energy for rib somatic dysfunctions, doming the diaphragm, lymphatic pumps, thoracic inlet release, and paraspinal muscle inhibition.

METABOLIC-ENERGY

Many PD patients report becoming easily fatigued with minimal exertion, and fatigue is higher among those with greater rigidity or who are akinetic because their body works harder to move.¹⁴ Patients with advanced disease may struggle to get sufficient nutrition due to inability to procure, prepare, or serve food for themselves. Some of these dietary issues can be managed with patient education and/or direct nutritional supplementation. PD patients may have difficulty with chewing and swallowing and/or gastrointestinal dysmotility. Osteopathic treatment in these patients should focus on balancing the energy intake/expenditure ratio by both decreasing the work of moving and improving neuromuscular aspects of eating and digesting as well as promoting good quality rest. One approach is OMT to improve oral motor function and swallowing by addressing restrictions to the muscle physiology. Particular attention should be directed at the lower face, cranial, and cervical bones, muscle tone and balance, and impingement or congestion on the glossopharyngeal, vagus and hypoglossal nerves.

BEHAVIORAL

Patients with PD have higher than average incidence of REM-sleep behavior disorder with underlying impaired sleep rhythm patterns. Most PD patients have hypomimia, or masked facies, largely due to hypokinesia, but the hypomimia may also involve poor emotional functioning. The prevalence of depression is higher than average in PD, and studies have found independent deficiencies in basic emotional processes such as empathy or recognizing emotion on the faces of others.¹⁹ Behavioral training can improve both the patient's outward expression of emotion and their ability to process emotion in themselves or others. PD patients may also benefit from tailored dance, boxing or other exercise programs which help improve motor planning, decrease falls, and improve motion amplitude.²⁰

Majority of OMT research for PD falls under the biomechanical model. Dysautonomia in PD has only recently been characterized and further studies are needed. There is sufficient evidence to recommend nutritional and behavioral management in PD.

RESTLESS LEG SYNDROME

While diagnostic criteria for Restless Leg Syndrome have changed over time, modern estimates in the US show a prevalence of 10-15% of the population with higher rates among females.

Incidence increased with parity (nulliparous females have incidence rates nearer to that of males). The age of onset is typically before 45 years with increasing severity of symptoms and sleep disturbance with aging.^{21, 22}

RLS is a common neurological disorder with motor, sensory, and circadian disruption. Patients feel an extreme urge to move their legs. This drive to move is associated with other uncomfortable sensations such as warmth, fizzing, pulling, aching, itching, throbbing or skin crawling.²¹ These symptoms worsen with prolonged rest, and they lessen or are alleviated by movement. This results in trouble initiating sleep as patients struggle to remain in bed for extended periods. Many people with RLS also experience periodic leg movements of sleep which are intermittent episodes of involuntary, forceful jerks of the foot into dorsiflexion during sleep. This can result in nighttime awakenings as well as soreness and pain of the legs in the morning. In many cases, the combination of trouble initiating sleep with frequent awakenings during the night results in daytime somnolence.²² Diagnosis is clinical, and the essential criteria outlined by the International RLS Study Group is in Table 2.²³

RLS can be either primary idiopathic or secondary. Primary idiopathic RLS is thought to stem from a genetic cause as 25-75% of cases are familial. Some of the causes of secondary RLS may be reversible (Table 3). Initial testing should include iron panel (including ferritin), CBC, and a metabolic panel. Although the pathophysiology of RLS is not clear, secondary causes have given insight to potential pathophysiologies and treatments. Early research found RLS associated with aberrant basal ganglia function and dopamine neurotransmission linked with D2 receptor density changes. Epidemiological studies show a higher prevalence of RLS in patients with multiple sclerosis having spinal cord lesions as well as lumbar radiculopathy. Recent research on RLS pathophysiology showed abnormalities in the A11 posterior hypothalamus nucleus, which provides the primary dopaminergic innervation to the D1 and D3 receptors of the spinal cord gray matter. This suggests that spinal cord tracts and/or reflexes may be involved. The treatment of secondary RLS includes first treating the etiology. In cases of iron deficiency, renal failure, and drug toxicity, there is often rapid resolution of RLS symptoms with iron supplementation, dialysis, and medication management, respectively.

BEHAVIORAL

The gold standard treatment in all patients is improved sleep hygiene and exercise, as they have been shown to be effective at decreasing symptoms and improving quality of life long-term.^{24, 25} Patients should first be counseled on these low risk, high benefit lifestyle changes.

NEUROLOGICAL & BIOMECHANICAL

Various classes of drugs have been shown to be effective for short-term relief. The International RLS Study Group 2013 task force performed a meta-analysis using current ICSI stratification system which showed Level A or high quality evidence for use of the GABA analogue pregabalin and dopaminergic agents such as pramipexole, ropinirole and carbidopa-levodopa for short term, 6 months to one year depending on the drug. High quality evidence generally means that further research is very unlikely to change the confidence in the estimated effect of the medication. Considering patient concerns, tolerability of the medication side-effects may limit their usefulness. In addition, long-term use is unfortunately associated with either decreased efficacy, augmentation of symptom severity, or shifting symptoms to begin earlier in the day. No medications have shown reliable long term efficacy at this time.²⁴ There is moderate to high quality evidence suggesting that mas-

sage, a vibration device targeting the abductor and flexor hallucis (Relaxis),²⁶ or electrical stimulation (via TENS machine) would also significantly improve symptoms.^{27, 28} There is potential for other non-pharmacological treatments such as OMM, as it may affect central and peripheral structure-function targets in RLS (Table 4).

The association of RLS with pathology of the spinal cord and nerve roots suggests that patients with lower body somatic dysfunctions would benefit from OMT and/or physical medicine to alleviate restrictions affecting spinal cord health. Counterstrain tenderpoints pertinent to RLS were identified by Dr. Douglas Longden in collaboration with Lawrence Jones, DO. The Counterstrain Assessed for Restless Legs (CARL) trial compared treatment of RLS patients with non-specific lower extremity counterstrain tenderpoints with treatment of the Longden RLS-specific points. The Longden RLS-specific points were those related to L5 with particular attention to the anterior points, progressing from the most severely tender to the less tender points. The Jones AL5 located at the anterior portion of the pubic bone, lateral to the pubic symphysis where the rectus abdominis inserts that is treated with marked hip flexion and ipsilateral rotation and contralateral sidebending for fine-tuning. In addition, there is AL5 1 cm lateral to the pubic symphysis pushing from superior to caudad that is treated in 20 to 30 degrees of ipsilateral hip extension and fine tuning. The Longden points showed statistically significant improvement in RLS symptom severity on the International Restless Legs Scale total score at six weeks over controls, similar to the effect size found with dopamine agonist. While the CARL study is limited by a small sample size, the benefits compared to risks of the counterstrain procedure and the lack of other tolerable treatments increase the level of evidence using GRADE criteria making it a justifiable recommendation in the management of RLS when the tender points are present.²⁹ In addition, evidence suggests that targeted biweekly massage using myofascial release, trigger point and other soft tissue techniques to lower extremity with emphasis on piriformis and hamstrings muscles were found to diminish symptoms.²⁷ Overall, use of the biomechanical model may decrease pain and restore muscle function.

METABOLIC-ENERGY

Correction of nutritional deficiencies such as vitamin B12, iron, magnesium, and folate with attention to genetic and autoimmune disorders affecting absorption and metabolism are specific concerns in RLS.

ESSENTIAL TREMOR

Essential tremor is the most common movement disorder. Reported prevalence rates vary but may be as high as 5.6% of the United States population. Mild familial ET is often well tolerated, and therefore may be untreated. An inheritable component may account for up to 70% of cases.³⁰ ET is characterized by a persistent bilateral 4-12 hz action and/or postural tremor typically found symmetrically in the upper extremities with less common involvement of the head, voice/larynx or lower extremities. At times, only one upper extremity is involved at the onset of the tremor with subsequent spread to the opposite extremity. Asymmetry of severity is not uncommon between limbs. Similarly, initial onset may be intermittent with later progression. ET is exacerbated by high adrenergic states including extremes of emotional experiences such as moving, employment changes,

TABLE 1:
Risk factors for developing PD and known causes of secondary PD

Category	Examples
Pharmacological <i>“Drug-induced parkinsonism”</i>	Classic and atypical antipsychotics Metoclopramide Prochlorperazine Reserpine
Toxins	Carbon disulfide Carbon monoxide Cyanide MPTP Aerosolized Manganese Organic solvents
Head Trauma	Isolated or repetitive injury (boxing)
Structural Brain lesions	Hydrocephalus Chronic subdural hematoma Tumor
Other Disorders	Wilson’s disease Hypoparathyroidism Pseudohypoparathyroidism Chronic liver failure Extra-pontine myelinolysis Neurodegeneration with brain iron accumulation Neuroacanthocytosis
Infection	Encephalitis lethargica (Economo’s encephalitis) HIV/AIDS Neurosyphilis Prion disease Progressive multifocal leukoencephalopathy Toxoplasmosis
Cerebrovascular Disease	Vascular parkinsonism

TABLE 3:
Known causes of secondary RLS

Category	Examples
Drug adverse event or withdrawal	Psychiatric medications: Anti-dopaminergic medications (antipsychotics/neuroleptics) Tricyclic antidepressants (TCAs) Selective serotonin reuptake inhibitors (SSRIs) Serotonin-norepinephrine reuptake inhibitors (SNRIs) Lithium Other classes of drugs: H1 blockers (e.g. Diphenhydramine) Alcohol (described with both abuse and withdrawal) Caffeine Beta blockers Opiates (Withdrawal)
Metabolic Conditions	Uremia Hyperphosphatemia
Vitamin and Mineral Deficiencies	Iron deficiency Folate or magnesium deficiency Vitamin B-12 deficiency
Neuropathy	Diabetic polyneuropathy Lumbosacral radiculopathy Lyme disease
Immune / Autoimmune Disturbances	MGUS (Monoclonal gammopathy of undetermined significance) Rheumatoid arthritis Sjögren syndrome Spinal multiple sclerosis

divorce, and death of a loved one, exercise, hunger and sleep disorders or deprivation. ET is relieved by ethanol consumption, which is part of the diagnostic criteria (Table 2). ET is most severe during the end of execution of fine-motor tasks, but can often be voluntarily suppressed with attention.

BEHAVIORAL

The first-line treatment recommendations for mild ET are conservative, starting with decreasing exacerbating factors. ET, while not necessarily triggered by stress states (unlike psychogenic tremor), can be exacerbated by even a little bit of stress. In fact, rates of social phobia among people with ET are higher than the general population.³¹ Stress management techniques such as 90 minutes of exercise daily, psychotherapy, meditation, and relaxation therapies could be crucial. People with ET have been shown to have lower average SPO₂ during sleep.³² Utilizing techniques to improve sleep (ex. opening up the airway in those with sleep apnea, increasing hours devoted to sleep or improving sleep hygiene in general) can decrease symptoms and improve overall wellbeing. Interventions that decrease the impact of common life stressors, improve sleep, and modify nutrition and exercise lifestyle should be offered upon diagnosis.

TABLE 2:
The key clinical diagnostic features of PD, RLS, and ET and their treatments. The diagnosis of PD, RLS, and ET are based on the history and physical exam. There are secondary causes of PD and RLS to diagnose and treat (Tables 1 & 3) in addition to the treatments outlined.

Disorder	Key Clinical Features ³⁵	Treatment ^{17,25,28}
Parkinson’s Disease	1. Bradykinesia	Dopaminergic Medications
	2. Rigidity	Physical Therapy
	3. Postural Instability- not caused by primary visual, vestibular, cerebellar, or proprioceptive dysfunction	Occupational Therapy
	4. Resting Tremor- may or may not be present	Speech Therapy Deep brain stimulation (DBS) Exercise
Restless Leg Syndrome	1. An urge to move the legs, usually accompanied or caused by uncomfortable and unpleasant sensations in the legs	Sleep hygiene
	2. The urge to move or unpleasant sensations begin or worsen during periods of rest or inactivity such as lying or sitting	Regular exercise
	3. The urge to move or unpleasant sensations are partially or totally relieved by movement, at least as long as the activity continues	Counterstrain to L5 tender-points
	4. The urge to move or unpleasant sensations are worse in the evening or at night than during the day or only occur in the evening or at night	Dopaminergic drugs and anti-convulsants may provide short term symptomatic relief, but they move the onset of symptoms to earlier in the day over time. Sleep aids and sedatives may also improve sleep and thus patient quality of life.
Essential Tremor	1. Action tremor (i.e. worse during use of the muscle) 4-12 Hz (Faster than Intention tremor)	<i>1st line options:</i> Stress management Beta Blockers- *Propranolol Anticonvulsant- *Primidone
	2. Usually has a positive family history	<i>Severe/refractory:</i> Topiramate, clozapine, mirtazapine, benzodiazepines and botulinum toxin injection.
	3. Alleviated at rest	<i>Surgical options:</i> Deep Brain Stimulation Thalamotomy
	4. Alleviated with alcohol consumption	

NEUROLOGICAL

Patients may choose to take medications for temporary reprieve during times of greater stress. Small amounts of ethanol, primidone, or propranolol (a beta blocker and sympatholytic) may improve symptoms. Primidone and propranolol are effective in up to 70% of patients, but they lose efficacy when used regularly. Most studies suggest that one year is to be expected before disease progression or drug tolerance renders them ineffective. In severe cases where pharmacological management was ineffective or contraindicated, surgical interventions such as DBS or lesion therapy of the thalamus may be appropriate.

Exacerbations of moderate to severe ET management strategies could include OMM, which has previously been found to decrease biomarkers of stress.^{15,33,34} OMM aimed at normalizing sympathetic tone could also potentially be helpful. Finally, tremor may cause soreness and change in resting tone in the muscles of the affected limbs. OMM may be helpful for managing such cases.

TABLE 4:

OMT techniques in specific regions for treatment of PD, RLS, and ET.^{17,25,35-37} Each physician will select the treatment modalities best suited for each patient's specific complaints. The table is designed to help guide the practitioner in creating a treatment plan that is individualized to optimize treatment effect. ROM: range of motion of the joint

Body Region	OMT Technique	Goals of treatment
Head	Occipito-Atlanto (OA) release	Increase ROM Normalize vagal tone
	Compression of the 4th ventricle (CV-4)	Normalize autonomic tone
	Occipitomastoid spread (V-Spread)	Normalize vagal tone Reduce compression of glossopharyngeal & accessory nerves Improve cranial bone motion Reduce jugular vein compression
	Balance membranous tension (BMT)	Reduce strains Improve cranial motion
Anterior Neck	Hyoid & tracheal articulation	Improve swallowing
	Anterior counterstrain points	Improve neck ROM & posture
	Muscle energy to the sternocleidomastoid & scalene muscles	Reduce compression of neurovasculature
Spine	Muscle energy to the paraspinal muscles & quadratus lumborum	Increase spinal ROM Improve posture & ambulation
	Articulation: Seated & Prone	
	Active or passive myofascial stretch	
	Paraspinal inhibition	Normalize sympathetic tone
Thoracic Cage	Rib Raising: Seated or Supine	Normalize sympathetic tone Increase rib motion
	Thoracic inlet release	Improve lymphatic & blood circulation Improve thoracic cage excursion
	Sternal myofascial release	
	Thoracic diaphragm release/ Doming of the diaphragm	
	Pectoral Lift	
Extremities	Spencer's technique and other articular techniques to upper extremity joints	Increase ROM Improve ability to perform activities of daily living
	Muscle energy to upper extremities dysfunctions	
	Scapular balanced ligamentous tension	
	Muscle energy for lower extremities (Especially hamstrings, adductors, and psoas muscles)	Improve ambulation
	Circumduction / articular techniques to lower extremity joints	
Pelvis & Sacrum	Sacroiliac joint gapping	Improve ambulation, decrease pain
	Pelvic diaphragm release	Improve lymphatic & blood circulation Promote digestion
Other	Mesenteric lifts	Promote digestion
	Celiac & mesenteric ganglia inhibition	

CONCLUSION

The movement disorders, PD, RLS, and ET have a wide variety of debilitating motor and non-motor symptoms to assess during patient care. Integration of the five models of osteopathic care can improve symptom management and overall quality of life. The behavioral component appears to be a critical part of care for PD, RLS, and ET. Poor quality and quantity of sleep is an exacerbating factor in all three movement disorders. The neurological perspective involves individualization of both pharmaceutical and OMT interventions (Table 4) based on patient physical examination and specific complaints. In movement disorders, the biomechanical approach is largely intertwined with the neurological model. The normalization of ANS tone or afferent input through musculoskeletal manipulation would benefit these disorders. In PD and RLS, the metabolic-energy model is integral to long-term optimization of function and quality of life. The respiratory-circulatory model is also a major concern in PD. OMM may minimize the stress-related sequelae of the conditions or, in some cases, decrease symptom severity or frequency. OMM can potentially help with treating many of the common complaints and symptoms in patients with movement disorders.

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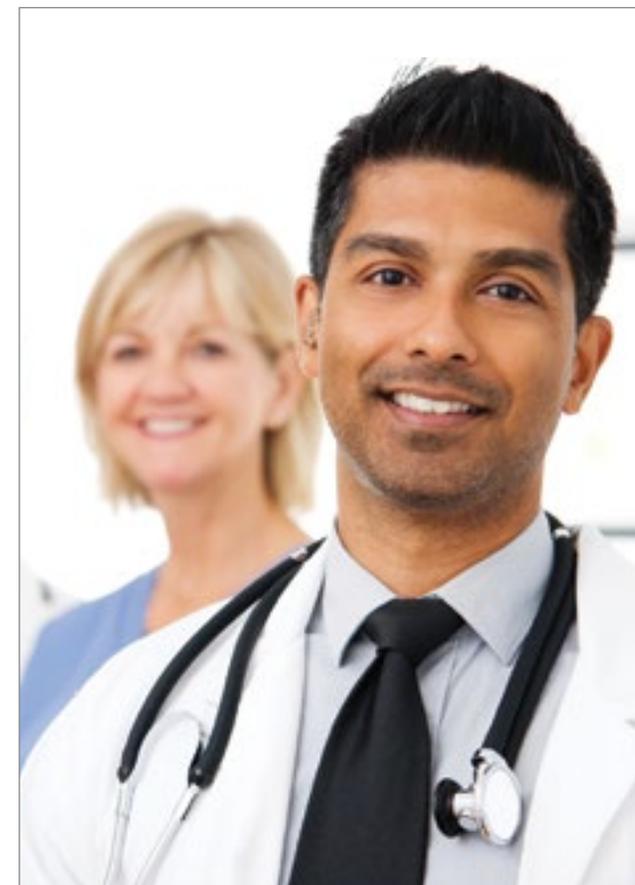
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Joint Pain & Dermatological Findings

Yuliya Gombar, DO

Lankenau Hospital, Main Line Health, Philadelphia, PA

A 78-year-old African American male presents to his primary care office with a minimally tender mass on the lateral aspect of his 2nd digit. His history was negative for fever, chills, and trauma to the area. He endorsed joint pain diffusely with multiple episodes on podagra in the past. The tender mass had started 4 weeks prior to presentation with increased swelling of a new minimally tender mass on the digit, which has since progressed to Figure 1. With growth of the mass patient now complains of slight numbness and cold sensation in the involved fingertip. The patient takes NSAIDs for joint pain that he states does relieve some of the discomfort associated with the mass. His past medical history is significant for hypertension, which he takes Losartan and hydrochlorothiazide, hyperlipidemia, osteoarthritis, and gout, for which he does not take prophylactic medication.

When palpated the joint demonstrated firmness rather than fluctuance and there was no purulent material with attempted incision and drainage. The mass was aspirated and viewed under microscopy as seen in Figure 2 and 3.

QUESTION 1

What is the diagnosis?

- A. Lyme Disease
- B. Gouty Tophi
- C. Cellulitis
- D. Paget's Disease

QUESTION 2

A 60-year-old man presents with pain and swelling in his great toe of three days duration. He has never had these symptoms before. On physical exam he is afebrile, and has erythema over the great toe.

Which of the following laboratory or imaging results would confirm the diagnosis of acute gout in this patient?

- A. Elevated serum uric acid level
- B. Gouty Tophi Radiographs showing joint space narrowing of the 1st metatarsalphalangeal joint and soft tissue radio-densities
- C. Magnetic-resonance imaging showing increased joint fluid and T2 signal intensity in the metatarsal head
- D. Arthrocentesis showing intracellular crystals that are thin, needle-shaped, and strongly negatively birefringent
- E. Arthrocentesis showing intracellular crystals that are rhomboid-shaped and weakly positively birefringent

QUESTION 3

A 67-year-old male active smoker with a history of gout, congestive heart failure (ejection fraction 35%), and moderate COPD is hospitalized for a CHF exacerbation. On the third day of his hospitalization, the patient has much improved from a respiratory stand-point but has developed a warm, painful right knee. Of note, the patient's home allopurinol was held during his hospitalization.

Which of the following joint fluid analysis results would be most consistent with a diagnosis of recurrent gout?

- A. Color: yellow; Clarity: clear; WBC: 700 (15% neutrophils); Bacteria: none
- B. Color: straw Clarity: cloudy; WBC: 1000 (25% neutrophils); Bacteria: none
- C. Color: straw; Clarity: clear; WBC: 2000 (30% neutrophils); Bacteria: none
- D. Color: yellow; Clarity: cloudy; WBC: 20000 (70% neutrophils); Bacteria: none
- E. Color: grey or bloody; Clarity: turbid; WBC: 90000 (90% neutrophils); Bacteria: many

QUESTION 4

A 58-year-old male presents to the emergency department with rapid onset of severe pain and swelling in his right great toe overnight. He reports experiencing a similar episode several years ago but cannot recall the diagnosis or the medication he was given for treatment. His medical history is significant for hyperlipidemia, poorly controlled diabetes, and stage 3 chronic kidney disease. The patient's last documented GFR estimate 2 weeks ago was 32 mL/min/1.73m². The interphalangeal joint of the right great toe is aspirated, with the synovial fluid aspirate showing intracellular crystals that are thin, needle-shaped, and strongly negatively birefringent.

Which of the following is the best management option for this patient?

- A. Initiate long-term colchicine therapy
- B. Intraarticular glucocorticoid injection
- C. Oral prednisone
- D. Aspirin
- E. Indomethacin

FIGURE 1:

Finger



FIGURE 2:

Aspirate of finger under microscopy

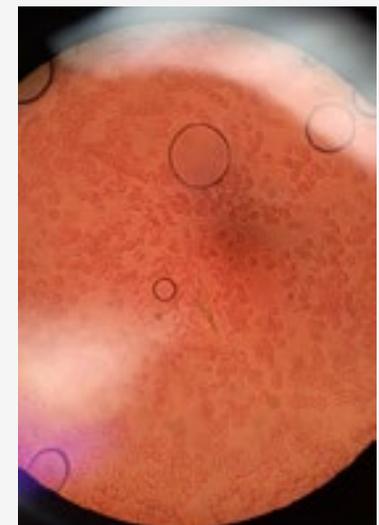
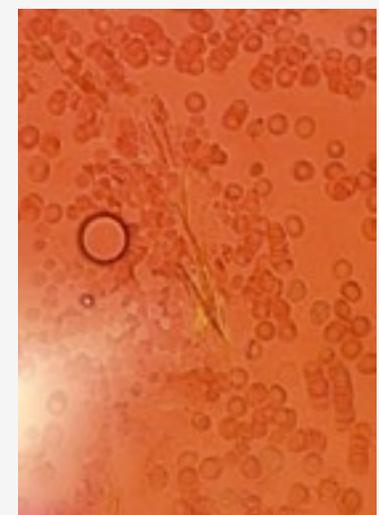


FIGURE 3:

Magnified Aspirate of finger



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DISCUSSION

Gouty tophi are nodular masses of monosodium urate crystals deposited in the soft tissues of the body. They are a late complication of hyperuricaemia and develop in more than half of patients with untreated gout. Complications of tophi include pain, soft tissue damage and deformity, joint destruction and nerve compression syndromes.⁹ Tophi can start to appear on average 12 years after the initial gout attack and have a higher prevalence in women who are on diuretic therapy. Although uncommon, it is possible for tophi to develop without previous acute gouty arthritis. Predominantly the tophi will appear on the fingers and helix of the ear. They contain a white pasty material and can enlarge until they come to the skin surface for drainage, form small sinus tracts that can secrete the white pasty material, or alternatively form large blisters, which may erupt and leave a continuously draining ulcer.⁹ In this case the crystals accumulated in the distal interphalangeal joint to such an extent that they had neurovascular compromising effects. When aspirated and viewed under microscopy needle shaped crystals were observed. The patient was started on Allopurinol for gout. The tophus was aspirated using a 22 gauge needle for both a diagnostic and therapeutic purpose. Minimal therapeutic relief via aspiration of material is important in this case given neurovascular compress demonstrated by numbness and cold sensation. Material is thick and hard to aspirate successfully so an incision can be made to relieve pressure or after referral to a surgeon. This patient's tophus resolved after 4 weeks of Allopurinol. Treatment for tophaceous gout in patients with normal renal function is pharmacological with combination allopurinol and uricosuric agents. If this fails and neurovascular compromise continues surgical excision is occasionally indicated.³ It is important to exclude other potentially more dangerous diagnosis such as Cellulitis, abscess, pyogenic granuloma, anthrax, herpetic whitlow, that could look very similar but would require alternative treatments. A good history and physical is paramount in establishing the correct diagnosis. Aspirating the lesion and microscopic evaluation can be very helpful in making the correct diagnosis, however updated guidelines no longer require joint aspiration if other criteria are met, please refer to Table 1.¹⁰

Gout is the most common inflammatory arthropathy and characterized by painful joint inflammation. Most common joint involved is the first metatarsophalangeal joint.¹ Precipitation of monosodium urate crystals in the joint space followed by the body's immune response to crystals is responsible for the painful joint inflammation. Diagnosis is made by clinical suspicion and using the 2015 Gout Classification Criteria an American College of Rheumatology Initiative (Table 1). A score of eight or greater classifies an individual as having gout. For simplicity, a web-based calculator can be accessed at <http://goutclassificationcalculator.auckland.ac.nz>.¹⁰ In the above clinical scenario, the information provided about the patient was insufficient to meet the diagnostic criteria and a joint aspiration was done. However, the new criteria no longer requires confirmation by aspiration of the synovial fluid in the affected joint showing intracellular crystals that are thin, needle-shaped, and strongly negatively birefringent.² In an acute gout flare the deposition of monosodium urate crystals in the joint space are exacerbated by hyperuricemia. The hyperuricemia occurs secondary to decreased excretion of uric acid from renal failure, hypertension,

thiazide diuretics, or alcohol, or less commonly, due to increased production of uric acid secondary to obesity, alcohol, hemolytic disease, or a purine rich diet.² Indication for pharmacologic urate-lowering therapy in patients with a history of gout are frequent or disabling attacks of gouty arthritis, clinical or radiographic signs of chronic gouty joint disease, tophaceous deposits in soft tissues or subchondral bone, gout with renal insufficiency, recurrent uric acid nephrolithiasis despite treatment with hydration and urinary alkalinization, even without another primary indication for urate-lowering pharmacotherapy; or in the presence of either recurrent uric acid or calcium oxalate nephrolithiasis in patients with hyperuricosuria, or urinary uric acid excretion exceeding 1100 mg/day when determined in men less than 25 years of age or in premenopausal women.⁷

Acute gout is treated with intra-articular steroids or NSAIDs such as indomethacin, whereas gout prevention is achieved with xanthine oxidase inhibitors (XOIs), including allopurinol and febuxostat, uricosuric agents, including probenecid, benzbromarone, and lesinurad, and uricase, available as pegloticase and rasburicase. It has been advocated that urate-lowering therapy should not be initiated until after an acute gout flare has resolved. Waiting up to at least two weeks after an acute flare has subsided to initiate urate-lowering medications has been generally accepted. This approach has been based upon the fact that acute urate-lowering can precipitate a gout attack and upon a concern that initiation of urate-lowering therapy during an acute attack may worsen or prolong the inflammatory arthritis. However, some experts have suggested that urate-lowering medication can occasionally be started together with antiinflammatory therapy during an acute attack.⁸ The goal range of urate-lowering therapy is serum urate <6 mg/dL.⁶ Patients should also limit consumption of certain purine rich foods such as organ meats and shellfish and also avoid alcoholic drinks like beer and products with high fructose corn syrup.³

TABLE 1.

The ACR/EULAR gout classification criteria¹⁰

	Categories	Score
Step 1: Entry criterion (only apply criteria below to those meeting this entry criterion)	At least 1 episode of swelling, pain, or tenderness in a peripheral joint or bursa	
Step 2: Sufficient criterion (if met, can classify as gout without applying criteria below)	Presence of MSU crystals in a symptomatic joint or bursa (ie, in synovial fluid) or tophus	
Step 3: Criteria (to be used if sufficient criterion not met)		
Clinical		
Pattern of joint/bursa involvement during symptomatic episode(s) ever	Ankle or mid-foot (as part of monoarticular or oligoarticular episode without involvement of the first metatarsophalangeal joint)	1
	Involvement of the first metatarsophalangeal joint (as part of monoarticular or oligoarticular episode)	2
Characteristics of symptomatic episode(s) ever		
- Erythema overlying affected joint (patient-reported or physician-observed)	One characteristic	1
- Can't bear touch or pressure to affected joint	Two characteristics	2
- Great difficulty with walking or inability to use affected joint	Three characteristics	3
Time course of episode(s) ever		
Presence (ever) of ≥2, irrespective of anti-inflammatory treatment:	One typical episode	1
- Time to maximal pain <24 h	Recurrent typical episodes	2
- Resolution of symptoms in ≤14 days		
- Complete resolution (to baseline level) between symptomatic episodes		
Clinical evidence of tophus		
Draining or chalk-like subcutaneous nodule under transparent skin, often with overlying vascularity, located in typical locations: joints, ears, olecranon bursae, finger pads, tendons (eg, Achilles)	Present	4
Laboratory		
Serum urate:		
Measured by the uricase method.	<4 mg/dL (<0.24 mmol/L)	-4
Ideally should be scored at a time when the patient was not receiving urate-lowering treatment and it was >4 weeks from the start of an episode (ie, during the intercritical period); if practicable, retest under those conditions. The highest value irrespective of timing should be scored	6-8 mg/dL (0.36-0.48 mmol/L)	2
	8-10 mg/dL (0.48-0.60 mmol/L)	3
	≥10 mg/dL (≥0.60 mmol/L)	4
Synovial fluid analysis of a symptomatic (ever) joint or bursa (should be assessed by a trained observer)‡	MSU negative	-2
Imaging		
Imaging evidence of urate deposition in symptomatic (ever) joint or bursa: ultrasound evidence of double-contour sign or vDECT demonstrating urate deposition	Present (either modality)	4
Imaging evidence of gout-related joint damage: conventional radiography of the hands and/or feet demonstrates at least 1 erosion	Present	4

ANSWERS

Question 1: Answer B) Gouty Tophi

Question 2: Answer D) The clinical presentation is suspicious of gout. The diagnosis is confirmed by arthrocentesis showing intracellular crystals that are thin, needle shaped, and strongly negatively birefringent.⁴

Incorrect Answers:

Answer A: While serum uric acid levels are often elevated in gout, it is not specific for the disorder and cannot confirm the diagnosis. Note that serum uric acid levels may be normal during an attack of acute gout.²

Answer B: While radiographs can raise suspicion for gout, there are other conditions that can have similar radiographic findings. Radiographs do not have the specificity to confirm the diagnosis.²

Answer C: While MRI can raise suspicion for gout, there are other conditions that can have similar radiographic findings. MRI does not have the specificity to confirm the diagnosis.²

Answer E: Arthrocentesis showing intracellular crystals that are rhomboid-shaped and weakly positive birefringent would confirm the diagnosis of pseudogout, caused by deposition of calcium pyrophosphate dihydrate (CPPD) crystals within the joint space.⁴

Question 3: Answer D) The synovial aspirate from this patient with a recurrence of gouty arthritis is most likely to yield cloudy yellow fluid with 2000-50000 WBC (70% PNMs), needle-shaped negatively birefringent crystals, and no bacteria, unless the joint is superinfected.⁴

Incorrect Answers:

Answer A: "Color: yellow; Clarity: clear; WBC: 700 (15% PNM); Bacteria: none" best describes an osteoarthritis effusion.⁴

Answer B: "Color: straw Clarity: cloudy; WBC: 1000 (25% PNM); Bacteria: none" best describes traumatic arthritis.⁴

Answer C: "Color: straw; Clarity: clear; WBC: 2000 (30% PNM); Bacteria: none" best describes an inflammatory arthritis due to SLE.⁴

Answer E: "Color: grey or bloody; Clarity: turbid; WBC: 90000 (90% PNM); Bacteria: many" best describes septic arthritis.⁴

Question 4: Answer B) This patient is suffering from acute gouty arthritis. Intra-articular steroid injection is the preferred treatment of gout in patients with renal failure.⁵

Incorrect Answers:

Answer A: Long-term colchicine is contraindicated in patients with renal or hepatic failure due to the risk of developing colchicine toxicity.⁵

Answer C: Given this patient's history of poorly controlled diabetes, intra-articular steroids would be preferred over systemic administration.⁵

Answer D: Aspirin is not used to treat acute gout flares due to its paradoxical effect on serum urate levels.⁵

Answer E: Indomethacin (along with other NSAIDs) is contraindicated in patients with a GFR of less than 60.²

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GOUT: BEST WAYS TO PREVENT ATTACK

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Gout is a form of arthritis that causes a sudden episode of swelling and pain in joints. It usually only affects one joint, but some people can have it in more than one joint. Increased levels of uric acid in the blood stream can form sharp needle-like crystals that build up in joints, causing pain and swelling. These crystals can also form kidney stones. Risk factors for gout include obesity, high blood pressure, chronic kidney disease, consuming too much alcohol on a regular basis, overeating, consuming large amounts of seafood or meat or high fructose corn syrup, and taking medications that affect blood urate levels. You can help prevent gout attacks by changing your diet and reducing your intake of these. Your doctor may treat you with an anti-inflammatory for acute episodes or place you on long term urate-lowering therapy to help prevent attacks.

PREVENTATIVE MEASURES INCLUDE:

- Avoid foods that trigger a gout flare, including red meat, seafood, asparagus, mushrooms and beverages that contain high fructose corn syrup.
- Limit alcohol intake, particularly beer and hard liquor. You may consider a small glass of wine per day if this has not caused symptoms for you in the past.
- Try to eat more vegetables and low-fat or nonfat dairy products.
- Eat foods made with complex carbohydrates such as whole grains, brown rice, oats, and beans.
- Drink lots of water to help flush uric acid from your body.
- Get physically active and lose weight if you are overweight.
- Consider taking 500 mg of Vitamin C daily as it has a mild urate-lowering effect.
- If you have other health problems such as heart disease, high blood pressure, kidney disease, or obesity, it is important that you work with your doctor to manage them. Improving your overall health may help with your gout too.

MEDICAL CARE & TREATMENT OPTIONS:

If you develop sudden severe joint pain with redness, swelling and tenderness to touch, please call your Osteopathic Family Physician. Gout is a treatable condition and your physician can help to reduce the pain and inflammation you are experiencing. Recurrent episodes may also benefit from long term medications to prevent or reduce the severity of attacks. In case of any emergency, you should call your doctor or 911 right away.

SOURCE(S): American Academy of Family Physician, Centers for Disease Control and Prevention, and UpToDate.com

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MOVEMENT DISORDERS

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Movement disorders affect about 28% of the U.S. population aged 50-89. They are conditions that affect how we move. The most common movement disorder is an essential tremor. An essential tremor usually affects the hands. It is an unwanted shaking that is present at rest and worsens with movement. Your doctor can help the symptoms with medication. Another movement disorder is Parkinson's Disease, affecting 10 million people. It is caused by the brain being unable to produce a substance called dopamine. The symptoms start gradually and include tremor, which progresses to stiffening of the muscles. There may be a genetic component to Parkinson's Disease, but some people are affected without having a family history. There are medications and therapies that can help slow down the progress of the disease and symptoms; however, there is no cure.

MEDICAL CARE & TREATMENT OPTIONS:

If you have any questions about movement disorders, please contact your Osteopathic Family Physician. Your physician can answer your questions and provide you with any additional information so that you can make the best informed decision based on the benefits and risks, as well as your religious, cultural, and personal preferences. In case of any emergency, you should call your doctor or 911 right away.

SOURCE(S): American Association of Neurologic Surgeons, Mayo Clinic, and The Lancet

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PREVENTION:

- Since we do not know the exact causes of Parkinson's Disease, we do not know exactly how to prevent it.
- Some studies have shown that caffeine in coffee and green tea may help prevent Parkinson's Disease.
- Other studies suggest that a healthy diet and exercise can also reduce the risk of movement disorders.
- If you already have Parkinson's Disease, know that you are at higher risk of melanoma so be sure to take the appropriate precautions to protect yourself from the sun such as applying sunscreen with an SPF of 15 or higher and wearing protective clothing.

WHEN TO SEE YOUR DOCTOR:

- The elderly may not notice new tremors or movement changes, especially if they have dementia. If your loved one is experiencing any of the symptoms above, please schedule them to see their family physician.
- Many movement disorders also affect behavior. If you or a family member start to notice a change in your behavior that you cannot explain, make an appointment to see your family physician.
- If diagnosed with a movement disorder, your primary health care provider may send you to a specialist called a neurologist who is trained in movement and brain disorders.
- If you develop a new tremor or other changes in movement, please make an appointment to see your family physician. In case of any emergency, you should call your doctor or 911 right away.

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