

2018

# Getting Ahead of the Curve: Screening and Early Detection of Scoliosis in Adolescents to Prevent Progression of Spinal Deformity

Patrick Saunders  
*The University of Vermont*

Follow this and additional works at: <https://scholarworks.uvm.edu/fmclerk>



Part of the [Medical Education Commons](#), and the [Primary Care Commons](#)

---

## Recommended Citation

Saunders, Patrick, "Getting Ahead of the Curve: Screening and Early Detection of Scoliosis in Adolescents to Prevent Progression of Spinal Deformity" (2018). *Family Medicine Clerkship Student Projects*. 348.  
<https://scholarworks.uvm.edu/fmclerk/348>

This Book is brought to you for free and open access by the Larner College of Medicine at ScholarWorks @ UVM. It has been accepted for inclusion in Family Medicine Clerkship Student Projects by an authorized administrator of ScholarWorks @ UVM. For more information, please contact [donna.omalley@uvm.edu](mailto:donna.omalley@uvm.edu).

# Getting Ahead of the Curve: Screening and Early Detection of Scoliosis in Adolescents to Prevent Progression of Spinal Deformity

1

Patrick Saunders, MS 3

Family Medicine: February-March, 2018

Newtown Primary Care

Project Mentor: Dr. Anureet Gill

# Problem Identification and Description

- ▶ What is scoliosis?
  - ▶ The lateral curvature of the spine in the coronal plain, often with concomitant vertebral rotation [12]
- ▶ Effects scoliosis can have on patients' health
  - ▶ Possibility of pain caused by progression of curvature [2]
  - ▶ Severe curvatures can lead to cardiovascular complications [7]
  - ▶ Studies have shown that overall quality of health of adults living with symptomatic scoliosis is significantly lower than the general population, and is comparable to patients living with chronic diseases such as osteoarthritis and chronic heart disease [4]
  - ▶ Research suggests impacts on lung development and exercise capacity [7]
- ▶ Can it be treated?
  - ▶ Depending on the severity of the curvature, treatment options include: Observation, bracing, or surgery
  - ▶ Bracing has been proven to be extremely effective in preventing progression of deformities if caught early enough, thereby avoiding the need to possibly undergo spinal surgery [14]

# Problem Identification and Description continued...

- ▶ A Difference of Opinion
  - ▶ The USPSTF has a Grade I recommendation concerning scoliosis screening, meaning they feel “the current evidence is insufficient to assess the balance of benefits and harms of screening for adolescent idiopathic scoliosis in children and adolescents aged 10 to 18 years.”
  - ▶ Groups that specialize in spinal deformities (Pediatric Orthopedic Society of North America, American Academy of Orthopedic Surgeons, North American Spine Society) all support and recognize the importance of screening for scoliosis due to the fact that early detection and bracing has a significant impact on halting the progression of the condition [3, 10]
- ▶ CT vs. Vermont
  - ▶ Connecticut state law requires that students in grades 5-9 be screened for scoliosis in schools
  - ▶ Vermont has no state laws requiring scoliosis screening in schools

\*Screening consists of physical inspection and the Adams Forward Bend Test, which is sometimes paired with measurement of the degree of trunk rotation with a scoliometer

# Public Health Cost

- It is estimated that 2-3% of the US population, or approximately 7 million people, are affected by scoliosis [6]
- Each year by the numbers [6]:
  - Scoliosis patient visits to private physician offices = >600,000
  - Children put into braces for treatment = approx. 30,000
  - Patients who undergo spinal fusion surgery = approx. 38,000
- In 2009 there were >3600 hospital discharges in the US for spinal surgeries to correct idiopathic scoliosis in children aged 10-17 [14]
  - Total economic burden of these procedures was approximately \$514 million
  - This cost was the second most expensive in this age group, trailing only hospital discharges related to appendicitis
- Between 2001 and 2011 the average hospital charge for adolescent idiopathic scoliosis spinal fusions increased from \$72,780 to \$155,278...utilization rates remained approximately the same over this period [9]
- For adult fusions the rate of price increased similarly over this same time period, however the utilization rate of these procedures increased by 64% over this span [9]
- Dr. Robert Monsey of UVM estimates that approximately 20 spinal fusion surgeries for scoliosis are performed each year at UVM Medical Center

# Community Perspective

I interviewed **Dr. Robert Monsey** (Orthopedic Surgeon/Medical Director of The Spine Program at UVM), **Dr. Lalaine Mortera** (Pediatrician at Newtown Primary Care), **Dr. Anureef Gill** (Family Medicine physician at Newtown Primary Care), **Rebecca McCray** (School Nurse at Edmunds Middle School), and **Anne Dalton** (School Nurse at Newtown High School) and these were some of the key takeaways from our conversations:

## Dr. Robert Monsey

- Raising awareness about scoliosis and early detection would be an incredibly valuable effort.
- The severity of physical appearance does not always correlate with the severity of the underlying spinal deformity. Deformities that may appear to be only minimal based on observation can often be much more severe when imaging is performed.
- The radiation that adolescents are exposed to when their scoliosis is being monitored is extremely minimal. The positioning and shielding that is employed for these types of x-rays also limits the associated risks to very low levels.
- Bracing is very effective at preventing the progression of curves to levels that require surgery. Surgery is not optimal compared to bracing and prevention of curve progression.
- You need to consider each individual who has scoliosis, and how the condition affects them personally. This deformity can affect each person in a variety of different ways.

## Dr. Lalaine Mortera

- Screening for scoliosis is extremely important. It's a no brainer!
- She does not understand why screening would not be done, knowing that early detection of scoliosis and proper preventative care can prevent the possible need for major surgery later on.
- She has seen cases when curves have progressed significantly in the span between yearly check-ups.
- She feels school screening can be very helpful to her in catching scoliosis early on, especially in cases where children may miss their yearly check-ups, or go a couple of years without seeing her.
- It is important to get orthopedics involved early on when scoliosis is detected so that the child can be properly followed.

# Community Perspective continued...

## **Dr. Anureet Gill**

- Screening for scoliosis in the primary care setting is often provider dependent.
- More urgency is placed on screening for scoliosis if a child has a known underlying condition, such as a neuromuscular disorder.
- She would happily welcome questions and concerns from parents about scoliosis if they were to have any at their child's visit. She would welcome the opportunity to educate parents and have a conversation with them about scoliosis.

## **Anne Dalton**

- CT state guidelines require screening for scoliosis in schools. Females are screened in 5<sup>th</sup> grade and 7<sup>th</sup> grade, and males are screened in 9<sup>th</sup> grade.
- If a screen by the school nurse is positive, the child's parents are contacted by letter and a phone call to inform them of the positive screen and recommendation for further assessment.
- Parent education about the potential health impacts of scoliosis takes place during the phone call informing them of their child's positive screen.

## **Rebecca McCray**

- Vermont schools do not perform screening for scoliosis. The only screening she is required to carry out is vision screening for 7<sup>th</sup> graders.
- Students with chronic conditions such as diabetes and asthma consume a majority of her time. The demands of her job can change drastically from year to year depending on the fluctuation of students with these chronic conditions
- Completing the 7<sup>th</sup> grade vision screenings throughout the year can be very challenging. There are many other curriculum requirements for the students that demand their time which makes it difficult to complete screenings.

# Intervention and Methodology

- Because children in VT are not screened for scoliosis in schools like children in CT are, and not all providers always perform screening, an informational handout was created to raise awareness about this condition.
- The handout gives an overview of scoliosis, it's possible impacts on the health of the individuals it effects, treatment options, and education for parents on how they can screen their children for signs of possible scoliosis.
- The handout's intended audience is parents of middle school students in Burlington. It is being included in the Edmunds Middle School monthly e-newsletter, and the goal is that parents who see the handout are encouraged to examine their children for signs of scoliosis that have possibly been overlooked. Furthermore, the hope is that parents who see the handout will have a greater awareness of how they can aid in screening their children as they continue to grow, and have the confidence to start a conversation with their child's physician if they have any concerns about scoliosis.

## Scoliosis

### What is it

- Abnormal sideways curvature of the spine



### Who gets it

- Infants, adolescents, and adults can all have this deformity
- Most common age of onset is 10-15
- Girls are at higher risk for curvature progression
- Vast majority of cases have no known cause

### How is it diagnosed

- Typically first noticed based on physical observation



- If suspected, x-ray to confirm diagnosis and determine severity
- \* Many states require screening in schools, VT does not

### Possible effects on health

- Depending on the magnitude of the curve
- Reduced heart and lung function
- Pain
- Reduced self-esteem due to cosmetic considerations

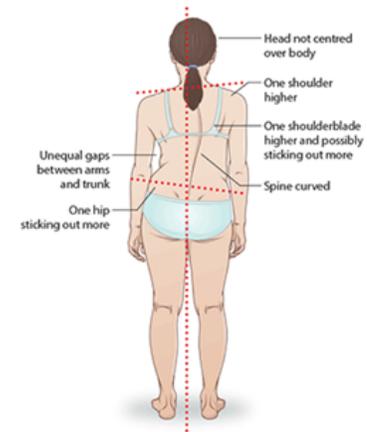
### Treatment options

- Observation
- Bracing
- Surgery
- \* If caught early enough, bracing is proven to prevent progression of deformity to levels requiring surgery

### What you can do

- Observe your child for some of the following physical signs...

#### Signs of scoliosis



- See this video for demonstration of how to screen your child:

<https://www.youtube.com/watch?v=7bfp0fcH7E>

**- Ask your child's doctor for more information. Be the one to start the conversation!**

\* For more reading visit:  
[www.scoliosis.org](http://www.scoliosis.org)

# Results/Response

The informational handout I created was shared with Dr. Monsey, Dr. Mortera, and Amy Ricketts (Medical Assistant at Newtown Primary Care and mother of two) to get their input and opinions on the possible effectiveness of the handout. They had the following to say:

Dr. Monsey

- "This looks great. Very simple and straightforward without too much information and yet give resources for more...good job."

Dr. Mortera

- The handout contains the essential information that will give parents a quality overview of the important basics about scoliosis.
- She believes the handout will effectively increase awareness among parents, and thinks it is a great idea to have it included in a school newsletter.
- As a physician, she appreciates a handout like this going out to parents because she feels it would help her do a better job of detecting scoliosis as early as possible in her patients. Parents see their children much more than she does, and detecting scoliosis as early as possible will be easier if they are educated and on the lookout too.

Amy Ricketts

- The handout is very visually appealing and draws you in. It would catch her eye in a newsletter and make her want to read more.
- If she saw this in a newsletter from her children's school she would absolutely examine them as a result and ask their doctor about scoliosis at their next appointment, regardless of whether she had seen any of the signs when examining them or not.

With great thanks and appreciation to the help of Rebecca McCray, my handout and a short description of the overall Family Medicine project will be included in a March edition of the Edmunds Middle School e-newsletter which goes out to parents.

# Evaluation of Effectiveness and Limitations

- ▶ The effectiveness of this effort to raise awareness about scoliosis among parents of children in Burlington and promote screening for early detection could be evaluated in the following ways...
  - ▶ Following the release of the e-newsletter, the number of visits to physicians' offices in the Burlington area in which parents initiate a conversation with their child's physician about scoliosis could be tracked as a quantitative measure of increased awareness.
  - ▶ With the ultimate goal of increased awareness and screening being the early detection of scoliosis and prevention of progression, statistics moving forward on the number of children in Burlington who are identified as having scoliosis that requires observational follow-up care and/or bracing compared with past statistics could be looked at as a way of judging effectiveness.
  - ▶ Questionnaires could be distributed in primary care offices throughout Burlington assessing whether parents saw the informational handout or not. If they did, follow up questions about their knowledge of scoliosis before and after seeing the handout could be included, as well as whether or not they inspected their child after reading the handout.
- ▶ Limitations include...
  - ▶ Many children do not see a primary care physician, or any type of physician, on a regular basis. This could be due to socioeconomic barriers, inattention to recommended health maintenance on the part of parents, or various other reasons. Regardless of the cause, the fact is that awareness of scoliosis does not matter if children are not able to be seen by a doctor and properly evaluated. If parents are not able to bring their children to a physician on a regular basis, there is no opportunity for conversation either.
  - ▶ There is no way of guaranteeing that parents will read the edition of the e-newsletter in which the informational handout appears.
  - ▶ The handout only appearing in the Edmunds Middle School e-newsletter limits the amount of parents who will potentially see it. It would be optimal if the handout were able to be disseminated to parents of children in schools all throughout the state of Vermont.
  - ▶ The appearance and progression of scoliosis most often takes place over an extended period of time. To truly evaluate the effectiveness of an intervention aimed at improving early detection and reducing the number of cases that progress to levels requiring surgery, follow up and data would need to be gathered over a span of many years, which is outside the scope of this project's intervention.

# Recommendations for Future Interventions

- ▶ While he was in office, former Vermont governor Peter Shumlin declared June, 2016 as Scoliosis Awareness Month in the state of Vermont. In his declaration he highlighted “the need for increased research to reduce the pain and suffering [scoliosis] causes” and acknowledged that “screening programs allow for early detection, and for treatment opportunities which may alleviate the worst effects of the condition.” [13] It is encouraging that less than two years ago the Vermont state government officially recognized the importance of screening for scoliosis, and future implementation of a state law that mandates school screening in VT, like CT already has in place, would be a seminal intervention.
- ▶ As studies have shown, bracing is extremely effective at preventing progression of spinal curves to levels requiring surgery. The success of bracing is dependent upon consistent everyday wear of the brace for a minimum number of hours. Dr. Monsey estimates that approximately 1/3 of adolescents who require bracing refuse to adhere to the proper use of their brace. An intervention aimed towards improving adherence to proper bracing among adolescents who require this level of treatment would be extremely valuable.

# References

1. "Adolescent Idiopathic Scoliosis." *Patients and Families*. Scoliosis Research Society. Web. 6 March 2018. [www.srs.org/patients-and-families/conditions-and-treatments/parents/scoliosis/adolescent-idiopathic-scoliosis](http://www.srs.org/patients-and-families/conditions-and-treatments/parents/scoliosis/adolescent-idiopathic-scoliosis)
2. "Adult Scoliosis." *Spine Center*. University of Maryland Medical Center. Web. 6 March 2018. <https://www.umm.edu/programs/spine/health/guides/adult-scoliosis>
3. American Academy of Orthopedic Surgeons. (2015). *Screening for the Early Detection of Idiopathic Scoliosis in Adolescents* (3<sup>rd</sup> edition). Opinion Statement Number: 1122
4. Bess, S., et al. "The Health Impact of Symptomatic Adult Spinal Deformity: Comparison of Deformity Types to United States Population Norms and Chronic Diseases." *Spine* 41.3 (2016): 224-233. DOI: 10.1097/BRS.0000000000001202
5. Dallas, Mary E. "Scoliosis Screenings Can Help Catch Spine Problem Early." *HealthDay* Oct. 17, 2017. *National Scoliosis Foundation Recent News*. Web. 6 March 2018. [www.scoliosis.org/scoliosis-screenings-can-help-catch-spine-problem-early/](http://www.scoliosis.org/scoliosis-screenings-can-help-catch-spine-problem-early/)
6. "Information and Support." *National Scoliosis Foundation*. BZDesign, Inc. web. 6 March 2018. [www.scoliosis.org/patient-support/](http://www.scoliosis.org/patient-support/)
7. Koumbourlis, A.C. "Scoliosis and the Respiratory System." *Paediatric Respiratory Reviews* 7.2 (2006): 152-160. DOI: 10.1016/j.prrv.2006.04.009
8. Luk, K.D.K., Lee, C.F., Cheung, K.M.C., Cheng, J.C.Y, Ng, B.K.W., Lam, T.P., Mak, K.H., Yip, P.S.F., & Fong, D.Y.T. "Clinical Effectiveness of School Screening for Adolescent Idiopathic Scoliosis: A Large Population-Based Retrospective Cohort Study." *Spine* 35.17 (2010): 1607-1614. DOI: 10.1097/BRS.0b013e3181c7cb8c
9. Martin, C.T., Pugely, A.J., Gao, Y., Mendoza-Lattes, S.A., Ilgenfritz, R.M., Callaghan, J.J., & Weinstein, S.L. "Increasing Hospital Charges for Adolescent Idiopathic Scoliosis in the United States." *Spine* 39.20 (2014): 1676-1682. DOI: 10.1097/BRS.0000000000000501
10. Pediatric Orthopedic Society of North America. Letter to Kirsten Bibbins-Domingo, Chairperson USPSTF. 26 June 2017. Web. 6 March 2018. <https://www.aaos.org/uploadedFiles/PreProduction/Advocacy/Federal/Issues/USPSTF%20Letter%20from%20POSNA%20and%20SRS%20June%202017.pdf>
11. Rajaei, S.S., Bae, H.W., Kanim, L.E.A., & Delamarter, R.B. "Spinal Fusion in the United States: Analysis of Trends from 1998 to 2008." *Spine* 37.1 (2012): 67-76. DOI: 10.1097/BRS.0b013e31820cccfb
12. Reamy, B.V., & Slakey, J.B. "Adolescent Idiopathic Scoliosis: Review and Current Concepts." *American Family Physician* 64.1 (2001): 111-117. PMID: 11456428
13. Shumlin, Peter. *Scoliosis Awareness Month*. 13 June 2016. State of Vermont Executive Department. Web. 6 March 2018. <http://governor.vermont.gov/sites/shumlin/files/documents/16-093%20Scoliosis%20Awareness%20Month.pdf>
14. Weinstein, S.L., Dolan, L.A., Wright, J.G., & Dobbs, M.B. "Effects of Bracing in Adolescents with Idiopathic Scoliosis." *The New England Journal of Medicine* 369.16 (2013): 1512-1521. DOI: 10.1056/NEJMoa1307337