



BY JARROD SHAPIRO, DPM

# New Rules for Post-operative Complications

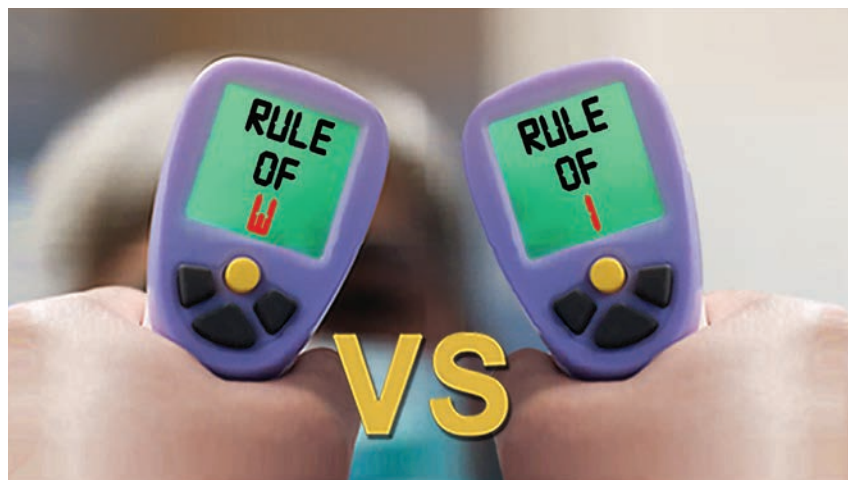
Here's an updated Rule of W's.

*Practice Perfect is a continuing every-issue column in which Dr. Shapiro offers his unique personal perspective on the ins and outs of running a podiatric practice.*

**A**s we learned in the January 2021 *Practice Perfect* column, atelectasis is not one of the causes of post-operative fever. In fact, the mnemonic of the Rule of W for post-operative fever (Wind, Water, Wound, Walk, Wonder), although classically memorized by almost all medical professionals, clearly needs some updating. The first update must be entirely removing atelectasis from the mnemonic.

Before we get to that, having mentioned an interesting study about the Rule of W, if the first W (atelectasis) is incorrect, then what about the rest of the Rule? Can it be applied to other post-operative complications?

Hyder and colleagues examined the Rule of W's to determine the frequency and timing of common complications<sup>1</sup>. They examined a cohort of general surgical and vascular surgery patients who underwent elective inpatient surgeries using the American College of Surgeons National Surgical Quality Improvement Program database between 2005 and 2011. They studied 614,525 patients and found 51,173



**Table 1 shows the complications, incidence, and most common post-operative day in which they occurred.**

(9.88%) suffered complications within the first 30 days. Table 1 shows the complications, incidence,

and most common post-operative day in which they occurred.

There are a few important points to consider from this study. First, the most common complication immediately after surgery was myocardial infarction, then in the first three days came pneumonia (peaking at Day 2), and then either pneumonia or urinary tract infections at Day 3. After that, surgical site infections were more common for the rest of the month after surgery with throm-

Complication	Incidence	Occurrence Time (POD)
Pneumonia	5,847	1, 2, 3 (peak on day 2)
UTI	9,459	3
Superficial surgical site infection	20,460	4 and 5-30
Deep surgical site infection	11,847	5-30
Venous thromboembolism	4,478	Consistent elevated risk through 30 days
Myocardial infarction	1,813	POD 0



Table 1: Post-operative complications with incidence and most common timeframe of occurrence.<sup>1</sup>

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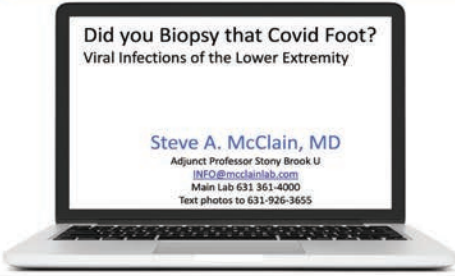
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Featured Lecture

**Steve McClain, MD**  
Adjunct Professor  
Dermatology and Emergency Medicine  
SUNY Stony Brook University Hospital  
Stony Brook, NY  
Owner McClain Laboratories  
Smithtown, NY

**Did you Biopsy that Covid Foot?  
Viral Infections of the Lower Extremity**



**Steve A. McClain, MD**  
Adjunct Professor Stony Brook U  
INFO@mcclainlab.com  
Main Lab 631 361-4000  
Text photos to 631-926-3655

**In this Lecture...**  
COVID Foot is contrasted with other common viral infections of the lower extremity, the underlying purpose is to recognize every day opportunities where podiatrists can save a life and save a limb through biopsy leading to early treatment. Indications for biopsy and treatment options will be discussed.

**Lecture Link - <https://prsnte.com/109>**

**1.25 CECHs**

*Post-Op Complications (from page 29)*

boembolism remaining a significant risk (though never a primary risk) throughout the post-operative month. Despite the fact that the study did not examine post-operative fever, all of the complications could present with an associated fever. It should also be noted that because the patients in this study underwent general and vascular procedures—not orthopedic types of procedures—the incidence of pneumonia and UTI may be skewed toward these complications. For ex-

ample, it is common for patients to maintain urinary catheters for a greater time after abdominal surgery than for most orthopedic procedures.

From this data analysis, the authors proposed a new Rule of W's for

post-operative complications in the first 30 days.<sup>1</sup>

- Waves (as in EKG waves—for MI)
- Wind (Pneumonia)
- Water (UTI)
- Wound (Superficial and deep surgical site infection)
- Walking (Venous thromboembolism)

This new Rule of W's is a much more accurate indicator of post-operative complications. One last observation from Hyder's study to bring us back to our topic of fever: They found fever to be common in the post-operative time period but found no specific association of fever with these complications, and the authors questioned the original rationale for the Rule of W's to predict fever causes at all.<sup>1</sup> With this study in mind, and based on January's *Practice Perfect*, we should cease our use of the Rule of W for post-operative fever because it is both incomplete and inaccurate. Instead, here is the suggested "Rule of I's" for post-operative fever (Figure 1).

This mnemonic includes the more common inflammatory causes,

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**Rule of I's for Post-operative Fever**

<b>Inflammation</b>	<b>Malignant hyperthermia, surgical stress &amp; tissue damage-induced</b>
<b>Infarction</b>	<b>Myocardial infarction</b>
<b>Infection</b>	<b>Pre-existing; early SSI; UTI</b>
<b>Inhalation</b>	<b>Pneumonia</b>
<b>Imbibition</b>	<b>Drug-related</b>

Figure 1: Rule of I's for Post-operative Fever

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## Post-Op Complications (from page 30)

eliminates atelectasis, and includes other causes not emphasized in the prior mnemonic. For a little more detail, take a look at Table 2. It includes some further specifics about the diagnoses and the timing related to the post-operative period. Keep in mind that although fever may occur with all of the diagnoses, procedure-related inflammatory causes are most common very early, while infections become increasingly common causes over the longer term.

As in all things medicine-related, nothing replaces a thorough history, physical, and rational thought process when addressing patient complications. However, these new rules will hopefully assist with framing and maintaining a proper thought process when taking care of your patients. **PM**

### References

<sup>1</sup> Hyder JA, Wakeam E, Arora V,

Cause	Diagnosis	Timing
Inflammation	<ul style="list-style-type: none"> <li>• Malignant hyperthermia</li> <li>• Surgical stress-induced</li> <li>• Tissue damage-induced</li> </ul>	Day 0-3
Infarction	<ul style="list-style-type: none"> <li>• Myocardial infarction with Dressler's syndrome</li> </ul>	Day 0 (decreases after 1 <sup>st</sup> 72 hours)
Infection	<ul style="list-style-type: none"> <li>• Pre-existing infection</li> <li>• Early surgical site infection (esp Grp A Strep &amp; C. perfringens)</li> <li>• Urinary tract infection (esp. indwelling catheters)</li> </ul>	Day 0 Day 0-3 (>4 days w/ other SSIs)  Inc risk w/ length of catheter presence
Inhalation	<ul style="list-style-type: none"> <li>• Pneumonia</li> <li>• DVT/PE</li> </ul>	Peak incidence day 2
Imbibition	<ul style="list-style-type: none"> <li>• Drug-related (β-lactam &amp; sulfa antibiotics, H2 blockers, heparin, phenytoin, procainamide)</li> </ul>	Days 4-30

Table 2: Diagnoses and timing for the new Rule of I's

Hevelone ND, Lipsitz SR, Nguyen LL. Investigating the "Rule of W," a mnemonic for teaching on postoperative complications. J Surg Educ. May-Jun 2015; 72(3):430-437.

**Dr. Shapiro** is editor of PRESENT Practice Perfect. He joined the faculty of Western University of Health Sciences, College of Podiatric Medicine, Pomona, CA in 2010.

