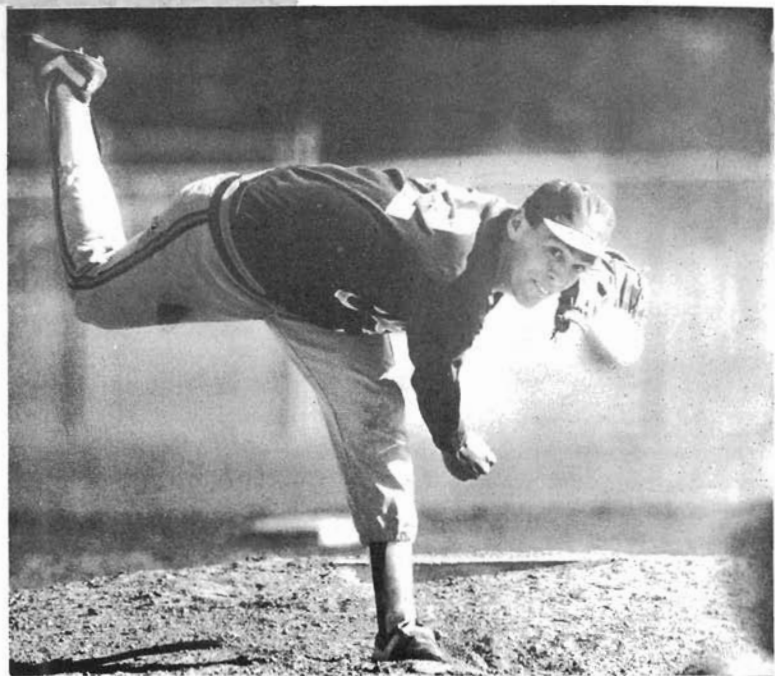


# A GUIDE TO SAFE, EFFECTIVE BASEBALL PITCHING

*Top Photo: Jarod Juelsgaard;  
Elk Horn-Kimballton High School; ISU; Florida Marlins  
Bottom Photo: Pat Heiderschelt;  
Lansing, Kee High School; ISU; Montreal Expos*





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*Illustrations by Louie Lyle  
Cover photographs courtesy of Lyle Smith*

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## PART I - The Mechanics of Pitching

Throwing, specifically throwing a baseball, is a function of balance, direction, and weight transfer. A pitcher must coordinate the delivery in a method that is mechanically efficient, then master an acceptable throwing motion through practice and repetition. Repetition will eventually reinforce muscle memory and replace the conscious mental effort of pitching a baseball. In other words, correct pitching technique will become subconscious rather than something the pitcher has to think about.

Development of biomechanical pitching skill requires a long period of time for practice. It is a between-game, or bull pen task. Very few pitchers are capable of changing their mechanics under game conditions. Learning and reinforcement of proper throwing mechanics in a non-competitive environment will transfer to the competitive environment.

For the purposes of explanation, the pitching delivery will be divided into four phases. The following phases, and their accompanying explanations, should facilitate better understanding and provide a clearer image of correct pitching biomechanics.

### PHASE I: Stance — Wind-up and Stretch

The starting stance, from the wind-up position, should include the following:

- 1) Eyes need to be fixed on target.
- 2) The pitcher's weight should be evenly distributed with the front half of the pivot foot in front of the pitching rubber during the wind-up. *Diagram #1* During the stretch, the pivot foot must be in front of the rubber in order to enhance the pitcher's balance. *Diagram #2*
- 3) The pitcher must assume proper alignment on the rubber. A right-handed pitcher should work from the right side of the rubber, a left-handed pitcher should work from the left side. Proper foot position on the rubber aids in the effectiveness of various pitches by maximizing the angle of pitch approach to the hitter.
- 4) The glove and throwing hands should be in a palm up/palm down relationship in order to hide the ball and pitch grip from coaches and hitters.



## Points of Emphasis in Phase I

- 1) The pitcher's eyes need to be on the target.
- 2) The pitcher's weight should be evenly distributed.
- 3) The pitcher must assume proper alignment on the rubber.
- 4) The glove and throwing hands are in a palm up/palm down position.

## PHASE II: Pivot (From the wind-up)

In order to initiate the pitching delivery from the wind-up a transfer of weight, commonly called the "rocker step", is used. The rocker step involves a short step backwards from the rubber with the non-throwing side foot. **Diagram #3** The rocker step should be short and compact so the pitcher's head remains over the pivot foot.

Following the rocker step, the body begins a squaring off maneuver commonly referred to as "the pivot". As the pivot move begins, the pivot foot will drop in front of the rubber and square off parallel to it. Once the pivot foot has been positioned, the hip flexor muscles of the stride leg begin a controlled lifting action in order to transfer the pitcher's weight solely to his pivot leg. This position is known as the "balance or post position". **Diagram #4**

**NOTE:** Throwing from the stretch, or set position, eliminates the need for the rocker step and squaring off of the pivot foot.

## Points of emphasis in Phase II

- 1) A short rocker step initiates the delivery.
- 2) The head remains over the pivot foot.
- 3) The stride leg is lifted to a balanced position using the hip flexors.



### PHASE III: Separation and Stride

Upon achieving a balance, or post position, the pitcher is poised to begin his throw to home plate. Correct biomechanics during this phase is critical since it involves the throwing action sequence, as well as a timed release of the pitcher's body toward home plate. The release of the hands and body towards home plate must be in proper sequence in order to minimize stress on the throwing arm, and maximize control and velocity.

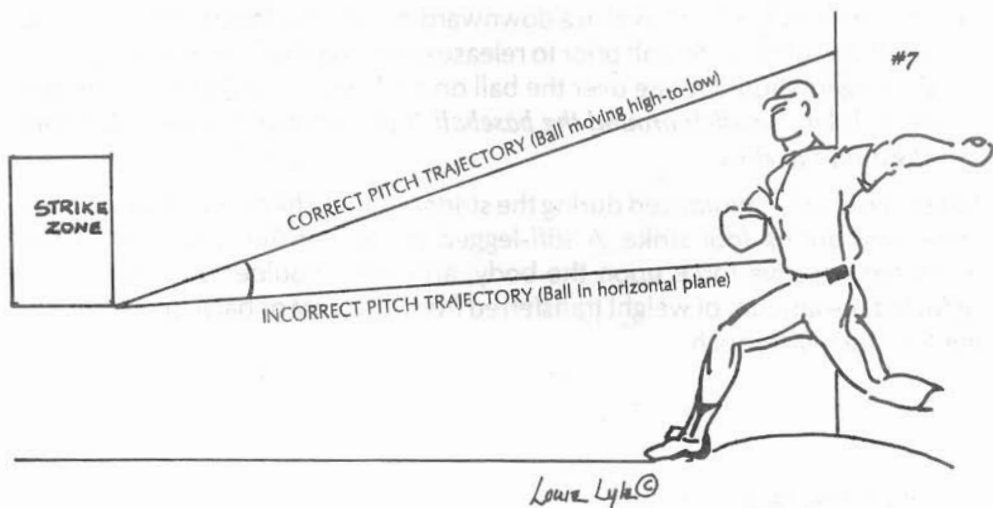
Proper release of the body from the balance, or post position, begins only after the pitcher's stride leg has achieved its highest point of elevation in the balance position, as previously illustrated in *Diagram #4*. When this has occurred, the

pitcher will separate (break) his hands in a thumbs-downward action with the throwing arm going down-back-and-up, to a position where the fingers are in front and on top of the baseball. *Diagram #5* At this point, the throwing elbow should progress to a position slightly higher than the throwing shoulder, and the elbow should be in line with the throwing shoulder, head, non-throwing shoulder, and home plate.

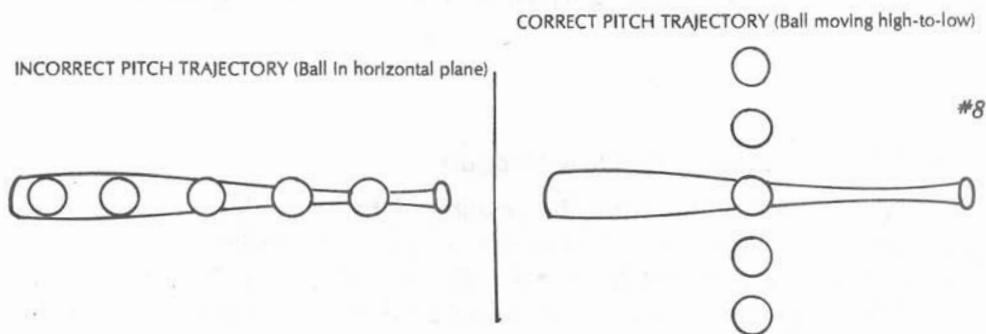


The action of the front (non-throwing) arm during the throwing action will be opposite that of the throwing arm in that it travels in a down-forward-and-up motion. This action efficiently counter-balances the body and will provide the needed leverage to effectively assist the throwing shoulder as it accelerates forward in preparation to release the baseball towards home plate. If done in correct fashion, upon foot strike of the stride leg, the relationship of the throwing arm, front arm, and body resemble a "T" position with both the lead elbow and throwing elbow as high as the shoulders. *Diagram #6*

The stride to the target begins in conjunction with the separation of the hands. It is important that the pitcher does not drive, push, or collapse the pivot leg during the stride. A controlled "fall" toward home plate with the head, lead knee, lead elbow, and lead shoulder will produce a greater downhill pitch trajectory and minimize stress on the throwing arm and shoulder. *Diagram #7* The drop and drive stride that many pitchers exhibit diminishes the height of release and creates added stress to the shoulder area.



Pitching in a downhill plane allows all pitches to be moving in two planes — forward-and-down or high-to-low — as they approach the hitter. It is far more difficult for a hitter to hit a pitch that is traveling toward them as well as moving down through the strike zone. *Diagram #8*



Pitching in a downhill plane can be effectively achieved if the following mechanical adjustments in balance position, stride, and ball release are followed:

- 1) Keep a firm back pivot leg. The pivot leg must not collapse in the balance position, nor prior to the stride towards home plate.
- 2) Perform a controlled "fall" towards home plate. Do not drop and drive with the pivot leg as it diminishes the height of the release of the ball.
- 3) Develop pitches that travel in a downward plane. The fingers of the pitching hand stay behind the ball prior to release on the fast ball. On breaking balls, the fingers should rotate over the ball on a curve ball, and through the ball on a slider. *Rotation around the baseball is incorrect and places additional stress on the elbow.*

Stress can also be minimized during the stride if the pitcher lands with the front knee bent during foot strike. A stiff-legged landing of the stride leg creates increased negative force upon the body, arm, and shoulder by substantially reducing the amount of weight transferred from the pivot or balance position to the final follow-through.

### Points of Emphasis in Phase III

- 1) Achieve a comfortable balance position.
- 2) Break the hands in a thumbs-down position.
- 3) Execute a controlled "fall" towards home plate with the head, lead knee, lead elbow, and lead shoulder.
- 4) Upon foot strike of the stride leg, the arms and body should form a "T" position.
- 5) Minimize stress by landing with a bent front knee during foot strike.

### *PHASE IV: Release and Follow-through*

Upon completion of the stride, the position of the pitcher's arms should have both elbows at approximately shoulder height. This position, as previously described in Phase III, and illustrated in *Diagram #6*, is the "T" position. From this position the pitcher enters into the final act of the pitching delivery, which is release and follow-through.



The release sequence begins as the throwing shoulder experiences an explosive acceleration towards home plate. When the ball is released properly, the following actions should be observed: *Diagrams 9 & 10*



- 1) The head is directly over the stride leg.
- 2) As the throwing arm travels forward, the throwing elbow should be even or slightly higher than the throwing shoulder.
- 3) The elbow snaps to full extension.
- 4) The wrist is straight and firm behind the ball, even on breaking pitches.
- 5) The fingers stay on the top part of the ball on all pitches.
- 6) The throwing shoulder, arms, and upper torso extend forward towards home plate.
- 7) The back foot comes off the rubber to complete the weight transfer from the back foot to the front foot.

During follow-through the throwing shoulder continues downward and completely replaces the non-throwing shoulder in terms of facing the plate with the throwing arm finishing in a position outside of the stride leg. *Diagram #11, see next page.* The lower back flexes in preparation for stress absorption necessitated by the deceleration of the throwing arm.

It is important to note that sore shoulders usually occur during the deceleration phase of the throwing motion. This is due to stronger muscle groups accelerating the arm than are decelerating it. Shoulder stress can be minimized by stressing proper weight transfer and follow-through mechanics during pitching delivery. Proper muscle balance and posterior capsule flexibility can also decrease the potential for sore shoulders.



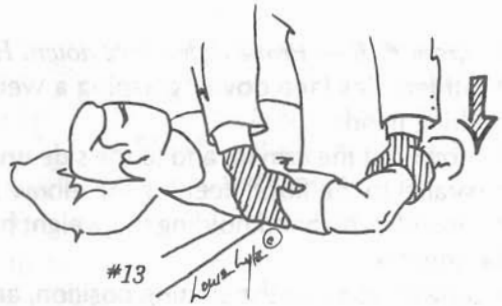
### Points of Emphasis in Phase IV

- 1) The throwing elbow should be even with, or slightly higher than, the throwing shoulder.
- 2) The head should be directly over the stride leg.
- 3) The wrist should be straight and firm behind the ball.
- 4) The fingers should stay on the top part of the baseball for all pitches.
- 5) The back foot comes off the rubber to complete the weight transfer from the back foot to the front foot.

## PART II — Conditioning and Injury Prevention Techniques

Pitching requires complete body sequencing. It requires correct rhythm along with adequate mobility and strength. A conditioning program that exercises, separately and specifically, the key muscles used in the four phases of pitching (stance, pivot, separation and stride, and release and follow-through) will enhance performance and reduce the risk of injury. Exercising muscles on both sides of the joints involved is important in order to maintain muscle balance. When muscles are properly balanced, they work together more efficiently adding to the efficiency of the pitching motion.

The structures comprising the shoulder joint must be flexible enough to allow extreme position and at the same time be strong enough to stabilize the joint. Emphasis should be placed on stretching the back of the shoulder joint as illustrated in *Diagram #12, on next page*. Excessive stretching of the front portion of the shoulder may lead to injury. The goal is to attain adequate shoulder flexibility while maintaining functional strength.

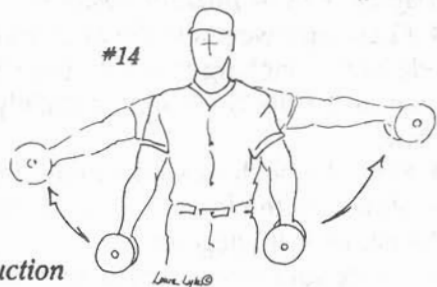


It is essential to have adequate shoulder mobility in all directions. External rotation is usually greater than 90 degrees in the pitching arm, while internal rotation is commonly less than 90 degrees. This imbalance can cause repetitive stress to the shoulder. Manually stretching the shoulder, as illustrated in *Diagram #13*, in an attempt to achieve 90 degrees of internal rotation, will help to decrease posterior tightness. This gentle, pain-free stretch should be held for 30 seconds and repeated 10 times.

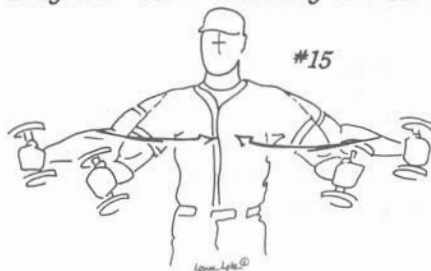
Strengthening the rotator cuff muscles of the shoulder joint help the athlete be better prepared to maintain correct pitching mechanics, over time, without injury. Diagrams #14 through #19 illustrate strengthening exercises to help prevent injury to a pitcher's shoulder. Each exercise should be repeated 10 times for 3 sets, using a weight that offers comfortable resistance.

**Diagram #14 — Standing Shoulder Abduction to 90 degrees Elevation**

- Stand with both arms at your sides, grasping a weight in each hand.
- Slowly raise your arms away from your sides to shoulder height, keeping the elbows straight, but not locked.
- Slowly lower your arms to the starting position, and repeat.



**Diagram #15 — Standing Horizontal Abduction**

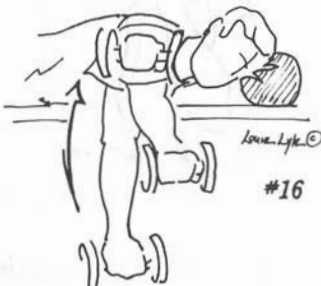


- Grasping weights in both hands, lift your arms straight out from the sides of the body until they are parallel with the floor, and the weights are perpendicular to the floor. Your arms and body now form a "T".

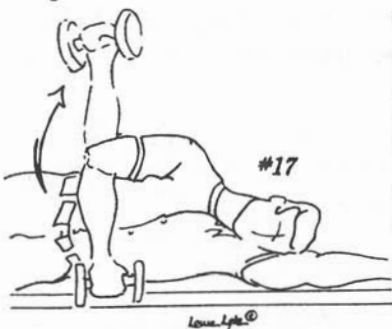
- Without bending the elbows, slowly move the arms to the front midline of the body.
- Slowly return the arms to the "T" position, and repeat.

**Diagram #16 — Prone (lying face down) Horizontal Abduction**

- Athlete lies face down, grasping a weight in the pitching hand.
  - Slowly lift the arm up and to the side until the arm is parallel to the floor, keeping the elbow straight.
  - Don't lift the hand holding the weight higher than the shoulder.
  - Slowly return to the starting position, and repeat.
- NOTE: This exercise can be repeated with the opposite arm as well.



**Diagram #17 — External Rotation**



- Lie on the side opposite the pitching arm, holding a weight in the pitching hand.
- Bend the elbow to 90 degrees so the forearm is close to the front of the body.
- Lift the forearm toward the ceiling, keeping the upper arm and elbow close to the body.
- Slowly return to the starting position, and repeat.

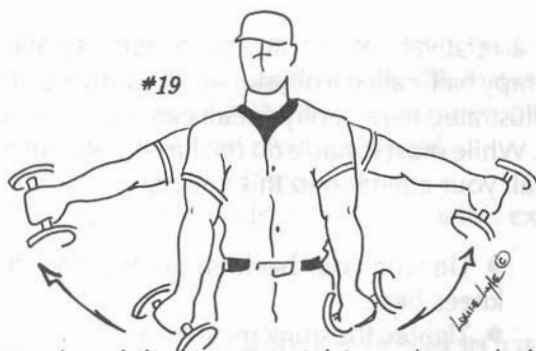
**Diagram #18 — Internal Rotation**

- Grasping a weight in the pitching hand, lie on the side of the pitching arm with the elbow pulled out from under the body so it is slightly in front of the body.
- Bend the pitching elbow to 90 degrees.
- Slowly lift the forearm toward the body, keeping the elbow at 90 degrees.
- Isolate your movement to the shoulder, being careful not to move the entire body.
- Slowly return to the starting position, and repeat.



**Diagram #19 — Scaption**

- Grasping a weight in each hand, stand with the arms at your sides, keeping the elbows straight with the thumbs turned inward and pointing down.



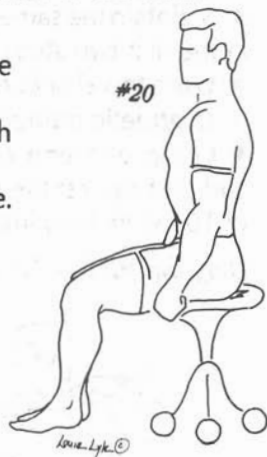
- Bring the arms forward so the weights are slightly in front of the legs.
- Raise both arms to 80 degrees, keeping the elbows straight with the thumbs pointing down.
- Slowly return to the starting position, and repeat.

Trunk stability is essential in order to hold the back in a *pain-free*, neutral position. The keys to developing trunk stability are strengthening the lower back and abdominal (trunk) muscles. When the muscles of the stomach and low back fatigue, or weaken, the curvature of the lower back increases. An increase in curvature of only a few degrees puts the pitching arm behind the pitching motion and promotes early release of the ball. To compensate for this early release, the use of the arm is increased with accompanying shoulder strain and injury.

Diagrams #20 through #25 illustrate exercises which will improve strength in muscles providing trunk stability. The emphasis in trunk stability exercises is learning to maintain and control a *pain-free*, neutral position of the back.

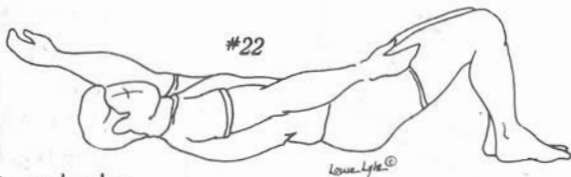
**Diagram #20 — Proper Sitting Posture**

- Hold the back in a *pain-free*, neutral position with the shoulders held high.
- Ears, shoulders, and hips should be directly in line with one another.
- The hips and knees should each form a 90 degree angle.
- Feet should remain flat on the floor.



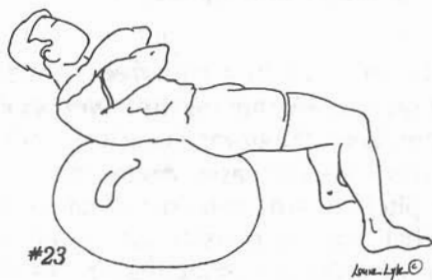
**Diagrams #21 & #22 — Low Back Stabilization**

- Lie on your back in a *pain-free*, neutral position, with the knees bent.
- Move the arms, with elbows extended, to a position alongside the head and tighten the trunk muscles for a count of 10, and relax.
- Tightening the buttock muscles also assists in maintaining a *pain-free*, neutral position.



Diagrams #23 and #24 illustrate a relatively new concept in trunk stability exercises. The use of a physical therapy ball, called a physioball, can be used in a variety of ways, two of which are illustrated here. A physioball can also be used to enhance exercises #21 and #22. While most schools do not have a rehabilitative ball available, we wanted to call your attention to this concept.

### Diagram #23

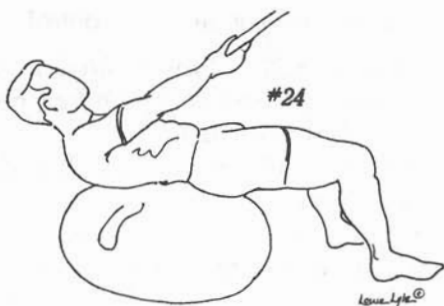


- Lie with your back on the ball and the knees bent.
- Tighten the trunk muscles and maintain a *pain-free*, neutral position, while keeping the pelvis stabilized and level.
- Using your abdominal muscles, lift the shoulder blades and upper back off the ball, while keeping the lower back stabilized with the lower back and buttock muscles.

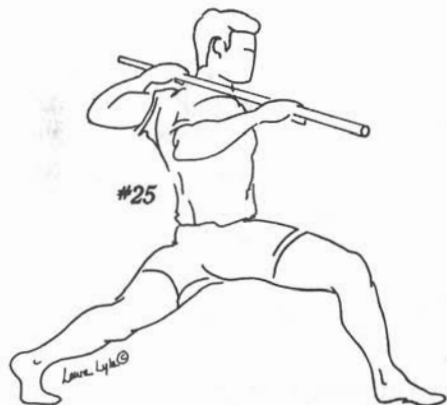
- Move the body backward on the ball so more of the trunk is off the ball.
- Slowly return to the starting position, and repeat.

### Diagram #24

- Maintain the same position as described in the first two steps of *Diagram #23*.
- Use a towel or baton, and the assistance of an athletic trainer or physical therapist.
- Grasp one end of the towel or baton and pull against the resistance for a count of 10, while keeping the trunk rigid.



### Diagram #25 — Lunge



- Athlete stands with the barbell resting on the shoulders.
- Barbell should be held in place with the hands, shoulder width apart.
- Begin with the feet shoulder width apart.
- Slowly take a large step forward with one leg, bend the knee as you go forward, and lower the body until the back knee almost touches the floor.

- The back should be in a *pain-free*, neutral position with the trunk rigid.
- The lead knee should be over the lead foot, in line with the second toe.
- Slowly return to the starting position by pushing off with the lead leg, and taking several short steps backward.
- Repeat with the opposite leg.
- Weight can be added to enhance this exercise, but only if qualified spotters are available.

### INJURY PREVENTION TIPS FOR COACHES

- 1) Always have pitchers stretch (emphasize internal rotation stretches) and warm-up prior to pitching.
- 2) Icing, and mildly stretching, the shoulder for 15 minutes after throwing will help prevent or reduce soreness.
- 3) Overuse injuries develop slowly. Carefully watch for symptoms such as shoulder and elbow soreness. Ice and rest are the best initial treatments. If soreness lasts more than 4-5 days, a physician should be consulted.