

# Yoga and Bone Health

Loren M. Fishman

Osteoporosis is a public health problem affecting individuals globally. Yoga has been found to prevent and reverse bone loss. Yoga may result in better balance, improved posture, and greater range of motion, strength, and coordination, all factors that also mitigate the risk of falls and fractures. A 12-minute, 12-pose yoga regimen is discussed in detail. Once learned, the ongoing use of yoga is safe, without cost, and may be done lifelong.

**O**steoporosis and low bone mass (osteopenia) affect 54,000,000 Americans and more than 200,000,000 people worldwide (National Osteoporosis Foundation, 2019). As the aging population grows, and people live longer, both domestic and global numbers will rise (Khan et al., 2017; Tan et al., 2019; Yuan et al., 2019; Zhang et al., 2018). The cost of care for osteoporosis and its resultant 2,000,000 annual fractures in the United States is estimated at \$19 billion and predicted to rise to 3,000,000 fractures and \$25.3 billion by 2025 (National Osteoporosis Foundation, 2019). One recent study found that less than 28% of 126,188 randomly selected patients with new osteoporosis diagnoses and with Medicare Part D covering drug costs even acquired the medications designed to counter osteoporosis (Siris et al., 2015). Given the expansion and aging of the population, this is a public health crisis.

Exercise in general and yoga in particular offer a proven means of raising bone mineral density (BMD) (Mishra et al., 2011) and improving bone quality, a measure that accounts for the protective effect of bone's trabeculae and correlates with fracture risk (Lu et al., 2016). The trabecular component is noted to contribute 30%–70% of bone strength, that is, its resistance to fracture (Chen et al., 2013; Fonseca et al., 2014; Seeman & Delmas, 2006), and in fact may be the part that weakens the most in the aging spine (Chen et al., 2013).

Yoga is safe, nearly without cost, self-practiced outside of medical facilities, and may result in musculoskeletal health with improved balance, better posture, wider range of motion, greater strength, and refined coordination (Lu et al., 2016; Sivaramakrishnan et al., 2019; Telles et al., 1994). These are all factors that further reduce the risk of falls and stooped posture that are causes of fractures. The focus of this article is on the use of 12 yoga poses (see Figures 2–13) on bone health and increasing BMD and bone quality in osteoporosis, low bone density, and healthy bone.

## Background

The value of exercise in bone health is well recognized (Al Anouti et al., 2019; Alkahtani et al., 2019; Angin & Erden, 2009; Mishra et al., 2011). Julius Wolff, a German anatomist and surgeon, prophetically wrote, “The architectonic of a bone follows the lines of force to which that bone is exposed” (Wolff, 1892). Since that time, this principle, known as “Wolff’s law,” has been shown accurate in studies at the tissue, cell, and biochemical levels (Delgado-Calle et al., 2017; Zeng et al., 2019). Running, weight lifting, and health club exercise sessions have been investigated and in some studies found successful in reversing osteoporosis (Pellikaan et al., 2018). Some studies found walking and weight-bearing ineffective in gaining bone, while resistance training could be successful, depending on the level of stress generated at critical bone locations (Bolam et al., 2013; Guadalupe-Grau et al., 2009; Howe et al., 2011; Langsetmo et al., 2012). Each of these activities is effective due to Wolff’s law, but none engages its principle as effectively as yoga does.

## YOGA

The many forms and practices of yoga are unified by its first text, the *Yoga Sutras* (threads of yoga), written approximately 2,000 years ago (Feuerstein, 2001). Its author, Patanjali, a physician and author of the first known text on grammar, proclaims that yoga is the science of steadying the mind. There are eight parts, two dedicated to rules of conduct (similar to the *Ten Commandments*), two devoted to breathing and physical poses (largely our current American yoga), and the last four focusing on inhibiting fluctuations of the mind (Taimni, 1972).

Yoga is associated with the Hindu religion but is not in itself a religion, although its goals are unequivocally spiritual (Feuerstein, 2001). It has no clergy, and no sacred texts; there is no lineage by birth. Yoga practices are extremely varied. To be a yogi is simply to do yoga and abide by its principles.

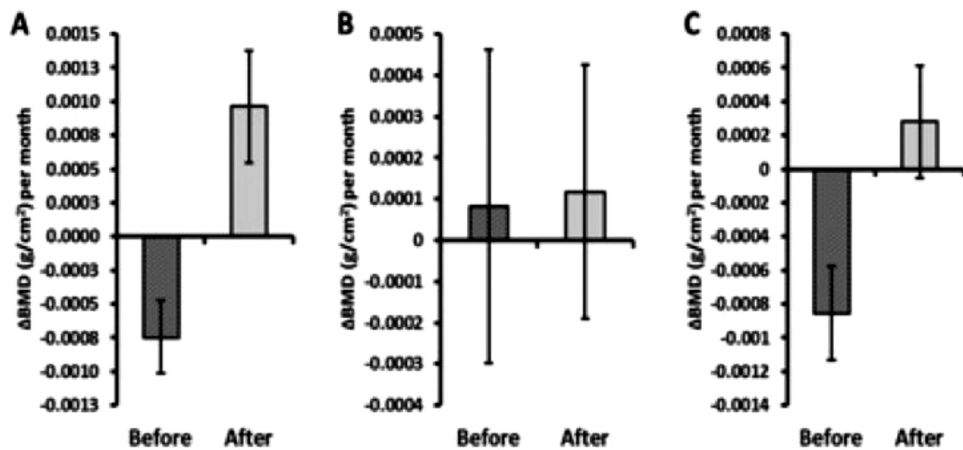
The *Yoga Sutras* contains only one pose, a seated one suitable for meditation. Sixteen more poses were added

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**FIGURE 1.** Comparing the change per month in the period before starting the Fishman Method Yoga with the change per month after starting it. Brackets indicate 95% confidence intervals.

to the literature in the 15th century by *Hatha Yoga Pradipika*, a number that doubled in the late 17th century with the *Geranda Samhita* (Singleton, 2010). One account of the current number and variety of yoga poses relates to how Western gymnasts and yoga practitioners shared a gymnasium at the palace of the Maharaja of Mysore and vigorous interchange took place. One may conjecture about the influence of yoga on modern Olympic gymnastics, but the calisthenic aspects of contemporary yoga are undeniable. It is likely that this

synthesis of strenuous and demanding calisthenics with the peaceable and serene goals of classical yoga has led to long-sustained isometric and demanding postures that stimulate the practitioner's osteoblasts (Junqueira & Carneiro, 2003).

### YOGA AND EFFECT ON BONE

Yoga uses Wolff's law and isometrically opposes powerful groups of muscles attaching to the same bone, thereby greatly increasing the stress on bone, and the consequent stimulus for bone strengthening (Fishman, 2009; Lu et al., 2016). The practice of yoga exploits this



**FIGURE 2.** *Vrikshasana*, the tree pose. Used with permission.



**FIGURE 3.** *Trikonasana*, the triangle pose. Used with permission.



**FIGURE 4.** *Parsvakonasana*, the side-angle pose. Used with permission.

relationship between stress on a bone and the bone's support system by generating far greater strain on bones than gravity or standard exercises.

The literature is sparse in addressing research on yoga and bone health, particularly BMD. There are several studies that have identified a positive effect of yoga on BMD (Lu et al., 2016; Motorwala et al., 2016).

In a 2-year pilot study conducted by Fishman (2009) using 12 yoga poses, 18 participants with osteoporosis or osteopenia did a 10-minute daily yoga regimen. Pre-yoga and 2-year post-yoga dual-energy x-ray absorptiometry (DXA) scans were compared, and participants who did yoga gained 0.76 and 0.94 points on the T-score for spine and hips, respectively.

A larger 8-year study by Lu et al. (2016) followed Fishman's (2009) pilot and investigated the efficacy of a 12-minute yoga regimen in a sample of 741 individuals worldwide who volunteered via internet. Compliant participants numbered 227, using 12 yoga poses for raising DXA scan BMD assays in the spine, hip, and femur.

A DVD was provided with directions for three versions of each yoga pose, elementary (beginner),



**FIGURE 5.** *Virabhadrasana II*, the warrior II pose. Used with permission.



**FIGURE 6.** *Parivrtta Trikonasana*, the twisted triangle pose. Used with permission.

intermediate (transitional), and classical (the customarily done full pose) that comprise the Fishman Method of *Yoga vs. Osteoporosis*. Participants were directed to start with the elementary poses for 1 week, then, based on how safely they could move, to advance to the intermediate, and finally to the classical version. Each pose was to be held for 30 seconds. Those with no yoga experience were to have at least one private lesson from a yoga teacher knowledgeable in Iyengar yoga. The yoga developed by B.K.S. Iyengar stresses steadiness, alignment, and muscular balance (Iyengar, 1962). Poses are held for 30 seconds to several minutes. Yoga activities were logged into an electronic scorecard after being recorded by the participant. Individual participation averaged more than 2 years.

The 12 poses selected for daily use were based on safety and impact on the spine, hip, and femur. Because forward flexion puts inordinate pressure on the anterior sector of the vertebral bodies, the location of almost all compression fractures (Sinaki, 2012a, 2012b), the poses avoided anterior compression as much as possible. Twisting poses that raise the torque in the circumferential regions of the vertebral bodies' cortex were used because these do not exert compressive forces on vertebral bodies (Cristofolini et al., 2013).

There were 174 (77%) compliant participants who had osteopenia or osteoporosis at the onset of Lu et al.'s



**FIGURE 7.** *Salabhasana*, the locust pose. Used with permission.



**FIGURE 8.** *Setu Bandhasana*, the bridge pose. Used with permission.

(2016) 8-year study. Mean BMD rose significantly for the spine and femur (see Figure 1). Although BMD also rose for the hip, different methods of measure in this calculated value eluded statistical significance.

Fourteen participants in the pilot study (Fishman, 2009) and 57 in the 8-year larger study by Lu et al. (2016) had been doing yoga for a number of years but had low bone density at the onset of the study despite their yoga practice as determined by a pre-DXA scan. More than 80% of all participants ( $n = 191$ ) increased BMD during their roughly 2-year study participation period. This may be due to three factors: (1) the type of yoga used in the study, B.K.S. Iyengar's yoga, emphasizing alignment such that one can do the poses arduously yet safely (Iyengar, 1962); (2) the 12 yoga poses being selected specifically for their ability to safely stress the spine, hip, or femur; and (3) strong and repeated encouragement to try hard by putting effort into doing the poses as best one could and holding each pose for 30 seconds.

There were 227 participants (202 women), mean age 68 years at the onset of the study, who performed a yoga routine at least every other day for 2 years. Pre-entry BMD for 77% of participants was below  $-1.0$  in at least one T-score measure. At the conclusion of their participation, 188 participants' spinal T-scores had improved significantly. Mean change for the entire group of 227 was as follows: spine,  $0.0029 \text{ g/cm}^2/\text{month}$ ,  $p = .005$ ; and femur,  $0.00022 \text{ g/cm}^2/\text{month}$ ,  $p = .053$ , but not significant for total hip, although there was a gain of  $0.000357 \text{ g/cm}^2/\text{month}$ . In the 100,000 hours that participants were doing yoga using the 12 poses, over the 10 years of studies (Fishman, 2009; Lu et al., 2016), there was no occurrence of any fractures, herniated discs, or serious injuries of any kind.



**FIGURE 9.** *Supta Padangusthasana I*, the supine hand to big-toe I pose. Used with permission.



**FIGURE 10.** *Supta Padangusthasana II*, the supine hand to big-toe II pose. Used with permission.

## HOW TO DO THE 12 YOGA POSES

The following is a description of the 12 yoga poses that includes a figure for each (see Figures 2–13, and Table 1), explanation of the purpose, contraindications, and props needed, special advice, and detailed instructions. All contraindications are “relative” (use with caution, benefits outweigh the risks) unless specifically denoted as “absolute” (avoid the pose). An experienced and resourceful yoga teacher can generally find a suitable work-around for poses with relative contraindications. Poses with absolute contraindications are denoted individually and should just be avoided. Follow along with each pose on the free YouTube video (<https://www.youtube.com/watch?v=o8SjystaH-E>) or by accessing it through [www.YIP.guru](http://www.YIP.guru) at a monthly fee (Fishman et al., 2019). Each of the 12 poses is presented in the video in three versions (beginner version for individuals with physical limitations or are new to yoga—named *Osteoporosis* in the video; an intermediate version for those who have this level of skill—named *Osteopenia* in the video; and the classical version). Even though the beginner version is named *Osteoporosis* in the video, people with osteoporosis can easily progress to osteopenia or classical versions of the pose, even while they still have osteoporosis. These are just labels indicating difficulty, not BMD status.

Work-arounds are given for each pose in Fishman et al. (2019) and also in Fishman and Saltonstall (2010). Before starting this YIP program, notify your physician who may consult [www.YIP.guru](http://www.YIP.guru) for a complete description



**FIGURE 11.** *Matsyendrasana*, the seated straight-legged twist pose. Used with permission.



**FIGURE 12.** *Matsyendrasana*, the seated bent-knee twist pose. Used with permission.

and contraindicated conditions as well as benefits of each pose.

In Figures 2–13, all poses are shown and explained in the classical version, with Sanskrit and English names as described by B.K.S. Iyengar in *Light on Yoga* (Iyengar, 1962) except Pose 4 *Parsvakonasana* (the side-angle pose), which is pictured in the intermediate version for easier understanding.

It is important to start with the beginner version and progress as quickly as one safely can. Some yoga practitioners favor warming up before beginning yoga and that is an option with the 12 poses presented. However, the poses are designed for the individual to start slowly, and in a practical and time-efficient way, serve as their own warm-up. A general guide to Do's and Don'ts for Doing the 12-Pose Yoga Program is offered in Table 2.

The poses are described on either the right side or the left side, but of course should be done on the opposite side as well. It should take about 30 seconds per side for each of the 12 poses (1 minute per entire pose), thus totaling 12 minutes. The two back bending poses, *Salabhasana* (the locust pose) and *Setu Bandhasana* (the



**FIGURE 13.** *Savasana*, the corpse pose. Used with permission.

**TABLE 1. 12 YOGA POSES**

	Sanskrit Name	English Translation
1.	<i>Vrikshasana</i>	Tree
2.	<i>Utthita Trikonasana</i>	Triangle
3.	<i>Virabhadrasana II</i>	Warrior II
4.	<i>Parsvakonasana</i>	Side-angle
5.	<i>Parivrtta Trikonasana</i>	Twisted triangle
6.	<i>Salabhasana</i>	Locust
7.	<i>Setu Bandhasana</i>	Bridge
8.	<i>Supta Padangusthasana I</i>	Supine hand to big-toe I
9.	<i>Supta Padangusthasana II</i>	Supine hand to big-toe II
10.	<i>Marichyasana III</i>	Straight leg seated twist
11.	<i>Ardha Matsyendrasana I</i>	Bent knee seated twist, or half Lord of the Fishes
12.	<i>Savasana</i>	Corpse

bridge pose) are symmetrical and therefore require only 30 seconds each, but the final resting pose, *Savasana* (the corpse pose), should be held for a minimum of 2 minutes.

It is essential not to rush while doing the poses, especially when first starting out, and it is advisable to have a qualified yoga teacher observing when learning this regimen of 12 yoga poses. Currently, there are more than 350 qualified teachers in 46 states and 9 countries whom we have trained to teach this exact 12-pose yoga format. Refer to [www.sciatica.org](http://www.sciatica.org) for a list of teacher locations and contact information.

**1. *Vrikshasana* (tree pose) (see Figure 2)**

**Purpose:** Laterally stress proximal femoral shaft and neck.

**Contraindications:** Imbalance, plantar fasciitis, recent total hip replacement (anterior approach), gluteus medius tear, recent ankle sprain.

**Props:** A yoga mat, a wall, and a yoga block (for work-arounds).

**Special advice:** Maximally abduct bent leg for balance; place it above or below but not on the knee joint.

**Instructions:**

1. Stand, feet parallel and perpendicular to coronal (frontal) plane.
2. Exhale as you abduct the right leg, placing the right foot, pointing downward, far up on the left medial thigh.
3. Complete your inhalation as you abduct both arms until hands are pressed together over your head, biceps behind your ears.
4. Reach upward with your fingertips; bring your pubic bone forward to make yourself even longer.
5. Hold this pose for several slow, even breaths.
6. Complete exhalation as your arms come down again.
7. Lower your right foot to the floor.
8. Stand still, feet are under your hips; ankles, hips, shoulders, and ears in a single plane.

**TABLE 2. DO'S AND DON'TS FOR DOING THE 12-POSE YOGA PROGRAM**

Do	Don't
1. Do notify your physician before beginning the yoga program who may consult <a href="http://www.YIP.guru">www.YIP.guru</a> for description and contraindication of each pose.	Don't start the yoga program on your own. Don't proceed without considering other medical conditions you have. Refer to <a href="http://www.YIP.guru">www.YIP.guru</a> (Yoga Injury Prevention) if more information is desired.
2. Do work with a yoga teacher qualified in teaching this method when learning the 12-pose yoga regimen. Refer to <a href="http://www.sciatica.org">www.sciatica.org</a> for teacher locations and contact information.	Don't start the yoga program on your own unless there are no accessible teachers. In that case, read each pose over carefully before doing it, and see the YouTube free video on Dr. Fishman's Method.
3. Wear loose, comfortable clothing that fits the environment. Loose-fitting elastic clothing is best.	Don't pick confining, stretch-resistant clothing that is inappropriate for the thermal conditions of your practice.
4. Do use props as needed for safety, support, and balance such as yoga mat, chair, a wall, yoga block, and yoga strap.	Don't try the poses without the specified props if you have undependable balance; don't try to challenge yourself without adequate precautions such as having a wall and chair nearby.
5. Do take your time while doing the poses to avoid head rush and potential falls.	Don't rush through the poses pushing over your limits. Don't force yourself through untoward pain during a pose.
6. Do consistently engage in the 12-minute, 12-pose yoga regimen daily.	Don't be inconsistent: If you miss Monday, you won't make any progress until Wednesday.
7. Do advance from beginner to intermediate to classical versions of each pose as soon as you safely can.	Don't start at a level that is overly challenging, and don't skip around.
8. Do minimize thoracic kyphosis; do the poses with an open chest and minimally kyphotic thoracic spine and comfortable lordotic lumbar spine.	Don't round your back
9. Employ quite intense mindful effort in doing the poses. Seek muscular engagement.	Don't simply approximate the pose and then remain inactive. Don't "hang out" in the poses.
10. Seek the true, classical alignment in every pose.	Don't compromise the ideal pose; do your best to safely attain it.
11. Do begin each pose with a solid, symmetrical, and steady foundation, whether it is your feet, your sitting bones, or your torso.	Don't tilt your ankle so that weight is only on the inside or outside of either foot or angle your torso over to one side to gain some advantage in some aspect of a pose.
12. Do schedule yourself a few minutes of downtime after completing the poses.	Don't forget pose 12, <i>Savasana</i> , the corpse pose; it is an important health and safety measure and is the gateway to more spiritual practice such as meditation.

This pose builds stamina and focus, as well as stretching the hips and legs. The lateral forces on the proximal femur have been measured and are increased 60% if the foot is placed anywhere on the vertical leg. Whether the foot is placed high up at the thigh, or down at the ankle, the pressures are equally elevated (Lu et al., 2016). Avoid foot placement directly at the level of the knee.

This is relevant in treating osteoporosis of the hip and femur.

## 2. *Utthita Trikonasana* (triangle pose) (see Figure 3).

**Purpose:** Anterior–posterior stress on proximal femur.

**Contraindications:** Imbalance, pubic fracture, adductor or hamstring strain, recent total hip replacement (anterior approach).

**Props:** A yoga mat, a wall, and a yoga block.

**Special advice:** Keep legs straight, torso lined up directly above your legs and parallel to the wall behind you.

### **Instructions:**

1. Stand with your back to a wall and sidestep your feet 3 ft apart. Turn the right foot and leg parallel to the wall, but face your torso straight out from

the wall. Angle the left foot 30° inward toward the right.

2. Arms outstretched, incline your entire torso to the right.
3. Inhale, firm your legs to keep them straight, and lengthen through the spine. Exhale, shifting your hips to the left. Extend your torso over your right leg, bending at the hips, not the waist.
4. Keep both sides of the torso long and parallel. Avoid collapsing down but extend the spine horizontally as you widen your thighs. Curl your tailbone down, and lift your belly in and up toward your chin.
5. Place your right hand on your ankle or block. Stretch the left arm straight up. If unsteady, lean lightly against the wall.
6. Roll your left shoulder, left ribs, and left waist back and up. Remain steady on your legs. Revolve your torso upward: The right groin widens, the left groin gets longer.
7. Radiate energy out through all your limbs and your spine. Stretch side-to-side as well as head-to-tail.
8. Inhale and come back up.

### 3. *Virabhadrasana II* (warrior II pose) (see Figure 4)

*Purpose:* Torque at femur, hips, and spine, leveraged force at femur, promotes balance.

*Contraindications:* Hyperlordosis, spondylolisthesis, spondylolysis, severe lumbar stenosis, recent total hip replacement, plantar fasciitis.

*Props:* A yoga mat and a chair.

*Special advisory:* Do not droop the back leg. Forward knee in line with the second toe.

*Instructions:*

1. With feet 4½ ft apart, bend the right knee to 90°; keep arms horizontal.
2. Stretch your back leg and revolve it outward from ankle to hip.
3. Draw the lower belly in and up. Stabilize your pelvis in this position; bring your torso upright and retract your shoulders back until they are just above your hips. Widen your thighs as you bring the pubic bone forward.

### 4. *Parsvakonasana* (side-angle pose; shown in chair in the intermediate version) (see Figure 5).

*Purpose:* Torsion at femur, hip, and spine; improves posture and balance.

*Note:* The classical version is shown in this figure of the pose; however, the intermediate version is described in the following text. This will give the less experienced individual an idea of how the chair and other props can be used in learning the postures and also for safety if balance or weakness is an issue.

*Contraindications:* Ischial bursitis, coccygodynia (painful syndrome of the tailbone), recent total hip replacement, plantar fasciitis.

*Props:* A yoga mat and a chair

*Special advisory:* Align toes, bent knee and hip; press lateral bent knee and biceps together.

*Instructions:*

1. Sit on a chair with your legs wide apart. Manually separate your buttocks.
2. Abduct your right leg to the side and place your foot directly under the knee.
3. Lean to the right, and moving from your hip, rest your left forearm on your left thigh.
4. Move the left leg to the left until it stretches straight, keeping the toes and the knee facing forward. Most of your weight will now be on your right hip.
5. With the muscles of your legs and pelvis active, curl your tailbone diagonally down toward your left foot, along the same angle that your whole body is now leaning.
6. From the core of your pelvis, open both legs out and elevate your spine.
7. Place your left hand on your left hip and roll your left shoulder back until your whole upper body faces forward.
8. For more intensity, turn your torso enough to the left to grasp the back of the chair with your left hand, and face straight ahead.

### 5. *Purvitta Trikonasana* (twisted triangle pose) (see Figure 6)

*Purpose:* This may be the most effective twist, putting circumferential pressure exactly on the vertebral bodies.

*Note:* Endeavor to make one large full-body twist, from the back foot's heel to the nape of the neck. This will make for finer balance, and spread the twist evenly along the body, enabling one part to compensate for another and act as a "safety valve" if necessary. However, in sacroiliac joint derangement and following posterior approach hip replacement, stopping rotation of the thighs at 90° degrees is advised.

*Props:* For beginner and intermediate versions: a chair, block, and wall.

*Contraindications:* (absolute) Second and third trimesters of pregnancy, (absolute) posterior total hip replacement, (relative) herniated lumbar disc, acute sacroiliac joint derangement, severe spinal (facet) arthritis, colostomy.

*Special advisory:* Be sure to keep both feet fully on the floor to minimize imbalance.

*Instructions:*

1. Stand with feet 3–3½ ft apart, turn your left foot out 90°, and turn your right foot 30° inward.
2. Stretch your arms out horizontally, palms down.
3. Take a breath.
4. Exhale and twist to your left as you bend forward, pivoting the right hip forward and placing your right hand on the floor or a block lateral to your left foot.
5. Scissor your legs together as you lengthen your spine.
6. Draw your right chest forward and your left shoulder back into the plane defined by the intersection of your legs. Make your torso narrow and long.

### 6. *Salabhasana* (locust pose) (see Figure 7)

*Purpose:* Places pressure on the spine's posterior elements and strengthens extensors.

*Props:* None.

*Contraindications:* (absolute) Colostomy, (relative) gastroesophageal reflux disorder (GERD), spinal stenosis or fusion, spinal surgical hardware such as Harrington rod, Cotrel-Dubouset, Scottish Rite or tethering procedures, anterolisthesis, facet syndrome, pregnancy in second or third trimesters.

*Special advisory:* Retain contact between the navel and the mat to avoid hyperlordosis.

*Instructions:*

1. Lie prone, arms at your sides with palms down. Stretch out and get long.
2. Lift from the nape of your neck and the back of your knees.
3. Gently press ankles together, inhale and lift your arms parallel to the floor.
4. Soften your stomach muscles—tightening reduces the arch.

### 7. *Setu Bandhasana* (bridge pose) (see Figure 8)

*Purpose:* To stimulate the posterior elements of the entire spine.

*Props:* A yoga strap to hold the upper arms together.

*Contraindications:* (absolute) Arnold–Chiari malformations, (relative) sacroiliac joint derangement, scoliosis, facet

syndrome, spinal stenosis, anterolisthesis, spondylolysis, spinal surgical hardware such as Harrington rod, Cotrel-Dubouset, Scottish Rite or tethering procedures.

*Special advisory:* Keep the legs and feet parallel. Relax your neck, throat, and jaw as you breathe. Avoid squeezing the buttocks too tightly or pulling the arms away from the shoulders.

*Instructions:*

1. Lie on your back and place your feet hip width apart, parallel, flat on the mat.
2. Place your arms alongside your body, palms facing up.
3. Inhale; curl your sitting bones down and apart to ensure that the pelvis stays wide.
4. Exhale and pull your arms into the shoulder sockets.
5. Lift your hips and chest as you inhale. As soon as you can, tuck each shoulder underneath your ribs and toward the spine so that the top of your shoulders are on the mat.
6. Interlace your fingers behind you. Press the arms down by straightening your elbows, propelling your torso upward.
7. Point your knees straight forward, lift and extend your tailbone toward your knees.
8. Lengthen the buttocks away from your waist without squeezing them tightly.
9. Stretch your sides and center from your throat out through the legs; powerfully press your feet away from you without moving them, elevating your torso and bringing your sternum further over your throat.
10. Exhale softly as you come down.

8. *Supta Padangusthasana I* (supine hand to big-toe I pose) (see Figure 9)

*Purpose:* Leveraged pressure on femur, hips, and lumbar spine.

*Props:* A yoga strap.

*Contraindications:* Ischial bursitis, hamstring tear, adductor tear, piriformis syndrome.

*Special advisory:* Press your hip away from its origin in the torso.

*Instructions:*

1. Lie supine (face up), legs straight out horizontally. Do not use a pillow.
2. Press the right leg down; raise the left thigh up to vertical, knee bent.
3. Straighten the left knee, and either grasp the foot with both hands or hold each side of a strap that wraps around the elevated foot just behind the ball of the foot.
4. Grasp the right wrist with the opposite hand or walk your fingers up the strap as far as possible. Extend your reach so that your elbows are straight, and your shoulders come up a little off the mat.
5. Tighten your quadriceps in both legs and draw your shoulders down to the mat.
6. Retighten your quadriceps.

9. *Supta Padangusthasana II* (supine hand to big-toe II pose) (see Figure 10)

*Purpose:* Lateral pressure on femur, hips, and lumbar spine.

*Props:* A yoga strap.

*Contraindications:* Ischial bursitis, hamstring tear, adductor tear of some hernias, piriformis syndrome.

*Special advisory:* Press your hip away from its origins in the torso.

*Instructions:*

1. Lie supine (face up), legs straight out horizontally. Do not use a pillow.
2. Press the right leg down; abduct the left thigh out to the side.
3. Straighten the left knee, and either grasp the big toe with the left hand or hold a strap that wraps around the abducted foot just behind the ball of the foot.
4. Either abduct the leg further or walk your fingers up the strap as far as possible.
5. Tighten the quadriceps of both legs and draw your shoulders down to the mat.
6. Retighten your quadriceps.

10. *Marichyasana III* (straight leg seated twist pose) (see Figure 11)

*Purpose:* Twisting the neck, rib cage, and the lumbar region, this pose stimulates bone creation at all the major fracture sites except the wrists.

*Props:* A yoga strap for beginner and intermediate versions.

*Contraindications:* Vulnerability to subluxation/dislocation of the shoulder or of the hip (e.g., after shoulder or hip replacement, or severe arthritis), recent herniated disc, torn gluteus medius, severe scoliosis, spinal fixation with Harrington rod, Cotrel-Dubouset, Scottish Rite or tethering procedures, fusion procedures, or ankylosing spondylitis.

*Special advisory:* Each time you breathe in, be aware of your posture, and remember to straighten your spine; each time you exhale, twist a little further at the thoracolumbar junction, moving your entire torso as you do so. Use a blanket if needed to tip the pelvis forward. Avoid straining the muscles between your ribs, the intercostal muscles, by increasing the intensity of the pose, gradually and twisting from the lowest rib.

*Instructions:*

1. Sit with your legs extended straight forward.
2. Use your hands to pull your buttocks and upper thighs back and apart.
3. Inhale to expand your chest, lifting the spine up powerfully. You can press your hands down on the floor beside you to get maximal lift.
4. Bend your right knee; place the right foot flat on the mat close to the inner left thigh.
5. Press the entire left leg down firmly; stretch fully through the sole of the foot.
6. On inhalation, lift your spine again; on exhalation, turn toward the right.



7. Hook your left upper arm outside your right knee. Straighten the right arm.
8. Move the spine in and up with inhalation and twist more with your exhalation. Lead the twist with your left lower ribs wrapping toward the right.
9. Turn your left arm inward to wrap it in front of and around your bent right leg.
10. Wrap your right arm behind your waist and clasp your hands or use a strap.
11. With inhalation, lift up and roll your right *shoulder* back. With exhalation, press your left foot down and advance your entire left *chest* forward, twisting to the right.
12. Within the constriction of the pose, maintain steady breath and a calm, focused mind.

11. *Ardha Matsyendrasana* I (bent knee seated twist, or half Lord of the Fishes, pose) (see Figure 12)

*Purpose:* Bending the leg that was straight in *Marichyasana* III relaxes the hamstrings and puts slack in the iliotibial band, permitting further rotation and proportionately greater stimulus to every major fracture site.

*Props:* A strap and a blanket.

*Contraindications:* Rotator cuff tear, herniated lumbar disc (best to twist to the opposite side), later pregnancy (absolute), torn gluteus medius, severe scoliosis, ankylosing spondylitis, vertebral fixation by rods or wires, vertebral fracture, colostomy.

*Special advisory:* Keep both ischial bones on the mat or use a blanket under the elevated one.

*Instructions:*

1. Sit on a folded blanket with your legs stretched out in front of you.
  2. Manually widen your buttocks and thighs.
  3. Bend your left knee and bring the foot outside your right hip. Bend the right knee and place the right foot flat on the floor to the outside of your left thigh, with the shin vertical. Place both hands on your right knee.
  4. Inhale; lift your spine up and also press down through the pelvic bones.
  5. Exhale; turn to the right, and cross your left elbow outside your right knee.
  6. Bring your right hand to the floor behind you; raise your right forearm to vertical.
  7. As you inhale, rise and straighten your spine, become taller. As you exhale, twist more, and walk your right hand around behind you toward the left.
  8. Look over your right shoulder. Vertically elongate spine and head.
12. *Savasana* (corpse pose; one version for all) (see Figure 13)

*Purpose:* To cease effort, relax and assimilate, and consolidate gains.

*Contraindications:* Late pregnancy.

*Props:* A yoga mat, three blankets, and possible eye cover.

*Special advisory:* After the initial setup, avoid fussing and fidgeting, become settled. This is the most

difficult pose: It requires quieting the mind (Iyengar, 1962).

*Instructions:*

1. Make sure the space is quiet and safe from distractions.
2. Fold a blanket to support a slight arch of your thoracic spine, another one rolled for under your knees, and a third folded one to support your neck and head. An eye cover may help relax your face and retreat from all outer stimuli.
3. Lie on your back with arms at your sides, palms up. Make sure that the chest-supporting blanket allows your shoulders to be flat on the floor.
4. Turn your legs inward to widen the back of the pelvis and then let the feet roll apart as you relax.
5. Lengthen your buttocks away from the waist if you feel any compression in the lower back.
6. Tuck your shoulder blades gently in toward the spine to open the front of your chest.
7. Make sure that your neck is long, and your chin and forehead are level. Then guide your attention through your whole body systematically from head to toe and back again, letting each part relax thoroughly.
8. Do not fret if your mind produces thoughts; just watch them unemotionally without being drawn into the content. Be a compassionate witness. You might notice yourself reviewing an event, thinking of a person, or making a plan. Try not to follow the pull of the thoughts, but passively observe them come and go. Trust in the process of letting go.
9. After 5–10 minutes of quiet rest (at least 2 minutes), take a few deeper breaths, stretch your arms and legs gently, bend your knees, and softly roll to the side. Take your time getting up, and respect whatever effects, changes, and benefits you may feel from your yoga practice. Remember your highest intention: to affirm your process of growth and healing.

## Conclusion

Orthopaedic nurses are in a unique position to promote musculoskeletal health through the safe use of yoga for the good of their patients, their healthcare team colleagues, as well as for themselves. Knowledge of the 12-minute, 12-pose yoga regimen may improve BMD and bone quality as well as increasing range of motion and improving posture, balance, strength, and coordination, all factors that can help protect against falls and fractures. This is particularly helpful in individuals with low bone density and osteoporosis who may be preoccupied with the fear of falling. Although patients experience a drop in BMD when they discontinue even the most modern medications (Tsourdi et al., 2017), as they inevitably are, yoga can be practiced life-long. It is desirable to work with a yoga instructor specifically trained in the 12-pose regimen to safely learn the poses and avoid injury. The ongoing practice of this yoga regimen can be a safe, low-cost intervention for bone health that is largely done at home and without adverse effects.

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