Patient Guide to
“The Ream and Run”
Shoulder Hemiarthroplasty with
Non-prosthetic Glenoid Arthroplasty

Seacoast Orthopedics and Sports Medicine
Center for Joint Replacement

The Future of Orthopedics Today

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Summary:
The shoulder is a ball and socket joint that allows the arm to be placed in an incredibly wide range of positions during everyday activities. The ball is formed by the head of the humerus (arm bone), and the socket is formed by the scapula (shoulder blade). The socket is also referred to as the glenoid. The surfaces of the ball and socket are formed by cartilage, a tissue that allows joints to glide in a smooth and frictionless way. The rotator cuff muscles and tendons attach around the margins of the ball and act both to stabilize the shoulder and elevate and rotate the arm.

Arthritis of the shoulder is a condition in which the cartilage on the humeral head and glenoid progressively deteriorates. As this process becomes more advanced, the joint surfaces become rough, and areas of bone may be exposed. Bone spurs form around the margin of the ball and the ball may begin to flatten and become misshapen. The figure to the right shows the surface of a humeral head destroyed by arthritis. Motion of the arthritic joint causes the surfaces to grate rather than glide. Progressive joint destruction makes the shoulder stiff, painful and unable to carry out its normal functions. While these degenerative changes most frequently occur in the 60s, 70s and 80s, there is an increasing incidence of people in their 40s and 50s with functionally disabling arthritis.

The X-rays of a typical arthritic shoulder show complete loss of the joint space with bone-on-bone. The view on the left shows how the ball is wearing to a flat rather than round surface. As the disease progresses, the bone continues to wear and deform. As the back wall of the socket increasingly erodes, the humeral head may shift partly out of the socket and rest on the back socket rim (shown in the picture on the right). These are characteristic, irreversible changes that occur in shoulder arthritis.

In addition to cartilage wear and bone erosion, arthritis results in stiffening and contracture of the soft tissues around the joint. These include the joint capsule, which has several important ligaments that support and stabilize the joint in specific positions. As boney changes result in loss of joint motion, the rotator cuff tendons also contract further stiffening the joint. This stiffness in itself can be a cause of pain apart from the bone-on-bone grinding.
The problem of shoulder replacement in young and active patients

While total shoulder replacement surgery has proven to be a successful treatment for advanced shoulder arthritis, the artificial components are not designed to withstand some of the demands that active individuals expect and wish to place on them. As more people continue to engage in sports and other demanding recreational activities into their 60’s, 70’s and 80’s, shoulder replacements are being asked to tolerate more wear and tear – often the same level of use that may have predisposed the shoulder to develop arthritis in the first place.

This is problematic for the plastic glenoid component that is used to resurface the native shoulder socket. This component is prone to wear out, loosen or even break in very active individuals. This is shown in the picture to the right. When failure occurs, additional surgery is usually required to remove the damaged socket as in the case shown. If the bone underneath the socket has also been damaged by the wear process, it may be impossible to put in another socket prosthesis. In this case, the success of revision surgery is less predictable and outcomes may be limited by inability to achieve a successful reconstruction.

It stands to reason that younger patients are more likely to experience socket wear in the course of their life as the plastic is exposed to a longer period of use and a more active lifestyle. Considering the risk of socket failure and the higher likelihood of needing revision surgery, a conventional total shoulder replacement, which resurfaces the arthritic socket with a plastic component, may not be the best option for younger and physically demanding patients over the long term.

While partial shoulder replacement of only the humeral head removes the risk of problems with the artificial socket, it does not address changes that occur to the surface of the native glenoid as a result of the arthritic process. As previously mentioned, the back part of the glenoid is preferentially often worn as is shown in the pictures to the right. This can result in a change in the orientation of the glenoid relative the shoulder blade, and occasionally a second concavity on the back half of the socket (also called a “double concavity.”) If these pathological changes are not addressed, then patients risk a poor outcome due to persistent abnormal anatomy on the socket side. Unless the replaced humeral head is recentered into a properly oriented and shaped, concave socket, patients will continue to have pain and progressive wear and arthritis on the socket side of the joint.

Thus, the optimal treatment for end-stage shoulder arthritis in young and physically demanding patients requires an alternative that allows the humeral head to articulate with a smooth, stable, concave surface that is properly oriented relative to the scapula without the use of a prothetic socket.

This alternative is referred to as shoulder hemiarthroplasty with non-prosthetic glenoid arthroplasty – also known as the Ream and Run technique. In this procedure, the humeral head is replaced with a
metal ball. The socket is not replaced but is refinished in way that gives it a smooth surface and a smooth curvature which matches that of the humeral ball. This process reshapes and reorients the worn and eroded arthritic glenoid so that it behaves in the same manner as an artificial plastic socket.

The metal ball can either be inserted with a stem as would be done for a standard total shoulder replacements. In some cases, however, if a patient’s anatomy allows access to the socket without removing the humeral head, a resurfacing cap prosthesis can be used (shown in the picture to the right). This option has the advantage of preserving more bone on the humeral side which may be advantageous if patients require revision surgery at some point in the distant future. Resurfacing prostheses are not possible in all cases, however, especially men with very large deltoid and pectoral muscles. In these cases, access to the shoulder socket for reaming the glenoid smooth is often not technically possible unless the head is removed and a standard stemmed prosthesis is used. Regardless of the type of humeral head however, the recovery and results are the same and patients are not aware of any difference in the feel or function of the replacement.

By removing the roughness of grating of the damaged joint surfaces pain and stiffness are effectively treated and the shoulder can move in a smooth and stable fashion. By excluding the plastic socket, non-prosthetic glenoid arthroplasty raises the tolerance of the shoulder for meeting the physical demands of active patients. Because wear, loosening and breakage of the metal ball are exceedingly rare, this procedure improves the longevity of the shoulder replacement and removes the risk of glenoid component failure.

Like a conventional shoulder replacement operation, the Ream and Run procedure is a highly technical procedure. It is best performed by a surgical team who performs this surgery often as certain technical aspects are critical to outcomes. In experienced, hands, this procedure can also address the restricting scar tissue that frequently accompanies arthritis and contributes to pain and stiffness. It can often take months, even up to a year, of progressive exercises before the shoulder achieves maximum improvement. Nevertheless, with persistence, patience and proper rehabilitation, most patients will successfully achieve marked improvement in their ability to perform a range of activities including those that require physical demand.

**Considering Surgery**

When symptoms begin to interfere with activities of daily of living and negatively impact one’s quality of life, joint replacement surgery may be considered. This is the most reliable solution for shoulder arthritis that has failed to respond to a program of rest, flexibility and strengthening exercises, anti-inflammatory medications and injections. The primary indication for surgical treatment of shoulder arthritis is **pain** that has failed to respond to other conservative measure. If patient have a level of pain that is tolerable and not limiting physical function, surgery should be delayed until symptoms worsen to a point that is no longer manageable.
When the normally smooth surfaces of the shoulder joint are severely damaged by arthritis or injury, shoulder replacement surgery is the most effective method for restoring comfort and function to the joint. There are other surgical options for treatment of arthritis of the shoulder, but none have proven as effective in terms of pain relief and patient satisfaction as shoulder replacement. Arthroscopy or "clean up" operations may be beneficial early in the course of the disease but have not been shown to provide lasting durable pain relief. Pain relief and range of motion improvement are often short-term with arthritis symptoms re-occurring within a few months.

**Who should consider Ream and Run?**

Shoulder replacement surgery is considered when:

1. the shoulder arthritis is a major problem that negatively impacts one’s quality of life,
2. one is sufficiently healthy to undergo the procedure,
3. one understands and accepts the risks and alternatives,
4. there is sufficient bone and tendon to permit the surgery, and
5. the surgeon is experienced in the technique of shoulder replacement.

**What happens without surgery?**

The natural history of shoulder arthritis is that it usually continues to progress over time. The rate of progression varies between individuals and is unpredictable. Sometimes the pain and stiffness from shoulder arthritis will stabilize at a level that is acceptable and manageable to the patient. In general, this surgery is elective, and can be performed whenever the patient decides that the arthritis has become disabling enough to warrant treatment. In the case of osteoarthritis delaying surgery typically does not compromise the success of surgery in the future. There are certain cases however where erosion of the socket from arthritis wear can become so severe that Ream and Run becomes technically more challenging, less predictable or simply not possible. In these cases, earlier surgery may improve outcomes by reducing the complexity of the reconstruction. If severe bone wear and erosion prevent the surgeon from achieving a smooth concavity with sufficient bone quality and stock after reaming the socket, then a standard total shoulder replacement with implantation of an artificial socket may be necessary.

**Effectiveness**

The Ream and Run procedure has proven an effective means of restoring lost comfort and function to the shoulder in younger patients with severe shoulder arthritis. One must recognize, however, that certain limitations in mobility and strength may persist following surgery, especially in those with severe deficits in function prior to surgery. This is because the muscles, tendons and ligaments around the shoulder joint may be contracted or atrophied from the arthritis process. Some of these changes may not be reversible with surgery.

There are several factors that influence the effectiveness of surgery and must be considered in light of the decision to undergo shoulder replacement:
1. **Bone Quality**: the success of the Ream and Run procedure depends on that ability to achieve a smooth concavity by reaming the glenoid cavity. It is critical however that this reaming process not violate the firm bone that lies beneath the cartilage — also called the subchondral plate. This hard bone helps support the metal ball. Beneath the subchondral plate is softer, spongy bone — also called cancellous bone. If too much reaming is required to restore a properly shaped and oriented cavity, the subchondral bone will be removed in the process and the metal ball will come to rest on the softer cancellous bone. This bone is not firm enough to support the loads applied by the metal ball during active use of the shoulder and progressive erosion of the socket can occur in these situations. Preoperative planning is critical in assessing which patients are at risk for this occurrence during surgery. These patients may require a conventional shoulder replacement, in which the artificial socket can provide sufficient support to the metal ball.

2. **Patient expectations**: although the goal of the Ream and Run procedure is to provide patients with unrestricted use of the extremity and virtually no limitations to their subsequent physical pursuits, it must be recognized that the replaced shoulder will never be “normal.” Overexertion from activities that apply high loads to the shoulder or repeated impact may result in some activity-related discomfort. The goal of this operation is to make patients substantially “better,” and while some patients do report virtually no limitation in function, this cannot be guaranteed in every case.

3. **Compliance with the rehabilitation**: a good operation is only half the battle. Participation in structured rehabilitation and adherence to a home exercise program are essential to recovery of motion, strength and function. Shoulders do not recover on their own and patients must take a responsible and active role in the process. Thus, the patient’s motivation and dedication are important elements of the partnership. Recovery after the Ream and Run can take longer than a normal shoulder replacement because the reamed bone must heal and undergo a molding process by the metal ball.

In general, 90% of patients report good to excellent outcomes following Ream and Run surgery. Relief of grinding arthritic pain is highly predictable and successful.

**Urgency**

Ream and Run surgery for osteoarthritis is an elective procedure that can be scheduled when circumstances are optimal for the patient. It is not an urgent procedure. The patient has plenty of time to become informed about the process of surgery and recovery.

Factors that the patient should consider in choosing the optimal time include the following:

1. The arthritis has become sufficiently disabling to impair the performance of daily activities. Patients who are still able to sleep comfortably and manage daily activities may and probably should consider waiting;

2. A planned period of time can be dedicated to the recovery and rehabilitation process that will not interfere with other scheduled events;
3. Overall health and nutritional status are optimal and will not limit the ability to comply with the performance of rehabilitation;

4. Motivation and readiness to undertake the process of surgery, recovery and rehabilitation is a priority.

Preparing for surgery

Preparation for total shoulder replacement begins several weeks before the surgery itself.

General health
Patients should optimize their health so that they will be in the best possible condition for this procedure. Smoking should be stopped a month before surgery and not resumed for at least three months afterwards to maximize the body’s healing potential. Any heart, lung, kidney, bladder, tooth, or gum problems should be managed before surgery. Any infection may be a reason to delay the operation. The shoulder surgeon needs to be aware of all health issues, including allergies and the non-prescription and prescription medications being taken. Some of these may need to be modified or stopped. For instance, aspirin and anti-inflammatory medication may affect the way the blood clots. If patients take blood-thinning medications such as Coumadin or Plavix, they should check with their primary care physician about the safety of stopping their use 5-7 days prior to the procedure. These medications can usually be resumed the day following surgery.

Medical clearance for surgery
Medical clearance for surgery by a patient’s primary care provider is a necessity to ensure preoperative readiness and plan for any postoperative management issues such as blood pressure and glucose control (diabetics). Depending on one’s health status, this may include testing such as an electrocardiogram, chest x-ray, bloodwork and sometimes further heart testing like an echocardiogram or stress test.

Dental clearance
To avoid the risk of infection, it is critical that any dental issues be taken care of before joint replacement. If you have not seen a dentist for more than 6 months, you may be asked to have a dental exam as cavities, tooth abscesses and gum disease can pose a risk of joint infection after a shoulder replacement.

Plan ahead for discharge
It is best to begin making necessary preparations for aftercare before surgery. In general, patients can be discharged to home on the 2\textsuperscript{nd} or 3\textsuperscript{rd} day following surgery with visiting services. For individuals who live alone or those without readily available help, arrangements for home help during the early recovery period should be made in advance.

The day before your surgery
You will receive a telephone call in the late afternoon or early evening of the day before you surgery giving you instructions on what time to arrive at the hospital and where to go. Your arrival may be scheduled for as early as 6:00 AM if yours is the first case of the day. It is critical to arrive on time so that the surgical schedule does not get delayed.
You may eat normally on the day before surgery but do not drink alcohol as this may heighten the risk of anesthetic complications such as nausea and vomiting. **DO NOT EAT OR DRINK ANYTHING AFTER MIDNIGHT.** The only exception is if your doctor specifically instructs you to take medication with a sip of water. Shower and shampoo either the night before or the morning of your surgery. Use of an antibacterial soap is recommended to reduce the risk of wound infection.

The day of your surgery: You may brush your teeth and rinse your mouth without swallowing any water. Wear comfortable, loose-fitting clothing and non-slip shoes. Valuable items should be left at home. Leave your own prescription medications at home as the hospital will provide you with these during your stay. Bring an up-to-date list of your current medications to the hospital to ensure that you receive the proper dosage and frequencies. If you wear contact lenses, it is better to bring eyeglasses to the hospital. Also be sure to bring a photo identification card, important telephone numbers for emergency contacts, and a book or magazine.

Once you arrive at the hospital you will be registered and given a room in the Preoperative Suite. Your family members may accompany you until you are taken to the preoperative holding area just before the operation. During this time, you will be given a gown to wear while your own clothing and possessions are safely stored. Your medications will be reviewed by the nursing staff and an IV will be started. The anesthesiologist will also meet with you to discuss any pertinent medical history and review their plans to keep you asleep and comfortable during the procedure. During your operation, your family and friends can wait in the day surgery waiting area or can go to other areas of the hospital. Pagers are provided to alert them when the surgery is finished so they can return to the waiting area to meet with the surgeon. Family and friends may also leave the hospital grounds and provide a contact phone number so they may be called after the case.

About the surgery

The surgical team
Shoulder replacement surgery is a technically demanding procedure that should be performed by an experienced surgeon in a medical center accustomed to performing shoulder joint replacements at least several times a month. While most general orthopaedic surgeons perform 1-2 hip or knee replacements a month, the average surgeon may only perform 1 shoulder replacement per year. Dr. Parsons is extensively trained in these procedures, having performed advanced specialty training in the field of shoulder surgery in one of the busiest shoulder replacement centers in the country. This included training in the management of complex and failed shoulder replacements as well as pioneering work on the Ream and Run procedure with the surgeon that developed this technique. Our surgical team includes dedicated staff experienced in performing these procedures and we carefully select our implants based on the best products available for individual cases. We currently perform more shoulder replacements than any other facility in New Hampshire (about 40-50 per years) and have refined our techniques and rehabilitation programs to expedite recovery and achieve the best possible outcome.

Anesthetics
Ream and Run surgery is performed using a combination of an interscalene nerve block and a general anesthetic. The nerve block is placed in the preoperative holding area immediately prior to surgery
and provides pain relief for 8-12 hours after surgery. During this time you will not have control over the arm and it is kept in a sling until you regain movement. General anesthesia is then used to induce a sleep state during the procedure. The nerve block reduces the amount of general anesthesia necessary to keep patients asleep which facilitates a quicker recovery with fewer side effects. Throughout the operation, you will be closely monitored including heart rate, blood pressure, and oxygen level, body temperature.

**Technical details**

After the anesthetic has been administered and the shoulder is prepared, a 4-5 inch incision is made across the front of the shoulder. This incision allows access to the joint without damaging the important deltoid or pectoralis muscles that are responsible for a significant portion of the shoulder's power.

The muscles and other tissues near the shoulder are mobilized by removing any scar tissue that may restrict their motion. The subscapularis tendon is mobilized with a fleck of bone to gain access to the joint. The arthritic humeral head is resected along with the bone spurs that surround it. This cut must be carefully planned and oriented to recreate one’s anatomy with the reconstruction. The humeral implant is chosen by trialing different sizes and selecting the one that best matches the patient’s anatomy and best restores the muscle balance in the joint without making the joint too tight or too loose. When possible, a resurfacing prosthesis can be used which avoids resection of the humeral head.

The arthritic glenoid is then exposed removing all bone spurs from its periphery. Adequate exposure is a challenging process, and the surgeon must be familiar with the location of important nerves and blood vessels. A special custom reamer is used to refinish the glenoid surface to create a smooth concave surface with a curvature that matches that of the chosen head size. Reaming corrects the shape and orientation of the socket, both of which are affected by arthritis.

A trial head is placed on the humeral prosthesis to determine proper sizing and muscle balance. The final humeral components are then inserted and the joint is relocated. The subscapularis tendon is then repaired back to humerus using a combination of wires and sutures. This allows for a very secure repair that allows immediate range of motion and use of the shoulder. Closure of the muscle and skin layers completes the procedure. A drain is placed which is removed on the morning after surgery. This prevents blood from collecting in the wound.
In the case of a resurfacing prosthesis, a special reamer is used to shape the head and remove the remaining cartilage. After determining the correct size of the prosthesis, the cap is then impacted onto the prepared bone. This has the advantage of preserving more bone in the event that future surgery is required. However, because the head is not fully removed as for a standard shoulder prosthesis, exposure of the arthritis socket may be difficult or impossible in some cases.

The X-rays below show a front and side view of a Ream and Run using a resurfacing prosthesis. Note that the curvature of the head matches that of the reamed socket so there is a smooth gliding surface. By matching the curvatures, the load is distributed evenly over the joint surface which improves comfort and limits wear. Note also how the ball is centered in the socket and the size of the ball matches the patient’s normal anatomy. These are all critical factors in the success of the operation.

**Length of surgery**
The procedure usually takes approximately two hours, however the preoperative preparation and the postoperative recovery may add several hours to this time. Patients often spend 1-2 hours in the recovery room.
Risks and potential complications

Complications related to Ream and Run surgery can be divided into those that occur during surgery, those that occur soon after surgery and those that occur at a time remote from the surgery.

- **Complications during the procedure include:**
  1. Injury to the axillary nerve or brachial plexus: these nerves control the muscles of the shoulder and arm. They may be injured by being overstretched during the surgical exposure or by being severed. This is extremely rare and surgeons experienced in shoulder replacement can generally minimize this risk through proper surgical technique.
  2. Fracture of the humerus bone: this can occur during insertion of the metal stem. Again, it is rare and can be avoided through careful attention to surgical technique.

- **Complications that occur soon after surgery include:**
  1. Wound infection is the main problem that can occur in the early recovery period, generally between 1-3 weeks. Symptoms include fever, weakness, fatigue and nausea. Signs include redness, swelling and wound drainage. If infection is diagnosed and treated early, it can be managed by an irrigation and debridement operation with preservation of the replacement. If however, the infection is long standing, the artificial components may have to be removed and a staged reconstruction performed after thorough antibiotic treatment.
  2. Rupture of the subscapularis tendon repair may also occur prior to full tendon healing. Overaggressive physical therapy or an accidental fall may cause this. Generally, this necessitates an exploratory surgery along with repair or reconstruction of this tendon.
  3. Stiffness can occur secondary to scar tissue that forms between tissue layers. Generally, with a properly conducted physical therapy program, this is not a problem. However, some patients have an overactive healing response and stiffness may be unavoidable. Stiffness may require a manipulation under anesthesia if further physical therapy cannot improve the range of motion.

- **Complications that occur remote from surgery:**
  1. Socket wear can occur over time. The rate at which this occurs is not known with certainty and may differ depending on the demands placed on the shoulder. It is likely more common in cases that require excessive reaming during surgery to correct a deformed glenoid. If this occurs and becomes painful, then it may be necessary to place a glenoid component later on.
  2. Late infections may occur by spreading to the shoulder from a different source such as the urinary tract, a tooth abscess, or other breaks in the skin. For this reason, we generally recommend that prophylactic antibiotics be taken prior to any invasive procedures such as dental work, colonoscopy, etc...
While you are in the hospital

Your care team
You will have a highly skill and experienced team take you through the process of recovery. This will include your surgeon, a physician assistant, a medical doctor, anesthesiologist, nurses, physical therapists, occupational therapists, and case managers. Our goal as a team is to ensure your health, comfort and safety while you recover. While surgery is generally not something patients look forward to, we aim to make the process a pleasant experience by providing excellent care.

Pain management
Adequate pain control is an important part of the postoperative management because it facilitates rehabilitation and allows recovery of motion. Our dedicated nurses will routinely assess our level of pain and provide medications as needed. The interscalene nerve block provides near complete pain relief for the first several hours after surgery. It is critical to anticipate when the block is wearing off, however so that medications can be given in advance to ease the transition.

Immediately after surgery, strong medications (such as morphine) are often given by injection. Within a day or so, oral pain medications (such as Oxycodone) are usually sufficient. These will be supplemented with Tylenol and Celebrex to create a “multi-modal” approach to blocking different pain pathways.

Pain medications can be very powerful and effective. Their proper use lies in balancing their pain relieving effect and their other, less desirable effects, such as sedation. Pain medications can cause drowsiness, slowness of breathing, difficulties in emptying the bladder and bowel, nausea, vomiting and allergic reactions. Patients who have taken substantial narcotic medications in the recent past may find that usual doses of pain medication are less effective. For some patients, balancing the benefit and the side effects of pain medication is challenging. Patients should notify their surgeon and the nursing staff if they have had previous difficulties with pain medication or pain control.

Physical and Occupational Therapy
Early motion after shoulder replacement surgery helps achieve the best possible shoulder function. Arthritic shoulders are stiff. Early motion is facilitated by the complete surgical release of the tight tissues so that after surgery the patient has only to maintain the range of motion achieved at the operation. However, after surgery, scar tissue will tend to recur and limit movement unless motion is started immediately. Early motion also stimulates recovery of muscle function.

During the hospitalization, the patient learns a simple rehabilitation program that will be used for maintaining the range of motion after discharge. This program consists of self-assisted forward elevation and external rotation, elbow flexion and extension and grip strengthening. On the day following surgery, the physical therapist will work with the patient to ensure proper technique and understanding of the program. Walking and use of the arm for gentle activities are encouraged soon after surgery. An occupational therapist will also provide information on how to manage simple daily activities during the early postoperative period.
**Hospital stay and hospital discharge**

Patients generally remain in the hospital for 2-4 days following Ream and Run surgery. We encourage patients to get up and moving as soon as possible to reduce the risk of complications like blood clots, pneumonia, urinary retention and constipation. On the morning following surgery, the drain is pulled and the bladder catheter is removed. Patients may take off the sling and rest the arm in a position of comfort. Physical and occupational therapy will start to educate patients on shoulder range of motion, neck and arm exercises that patients can perform by themselves.

Criteria for discharge either to home or to a rehabilitation hospital include:

1. a clean and dry incision without signs of infection
2. normal bowel and bladder function
3. adequate pain relief with oral pain medications
4. ability to properly perform and comply with home range of motion exercise program
5. adequate support to ensure patients are safe if going back to the home environment

A case manager from the Social Services Department of the hospital will visit with you a day or two after surgery to help in discharge planning. If you have any concerns about your ability to manage personal care, mobility, medications or other recovery needs once you return home, bring them up with the case manager so they can provide the appropriate assistance and advice. For patients who return directly home after discharge, Social Services can arrange for visiting nurses and therapists until patients are sufficiently mobile to progress to outpatient therapy. For patient transferring to inpatient rehabilitation, the case manager can help initiate the necessary paperwork and arrangements.

**When you return home**

**General Information**

You should try to return to normal eating and sleeping patterns as soon as possible and be sure to get ample rest while your body recovers from surgery. Proper nutrition including foods rich in protein and fiber are important for wound healing and avoiding constipation. If you smoke, every effort should be made to reduce or stop nicotine consumption for the first several weeks as it impair wound healing. Patients with diabetes should also make every effort to keep blood sugars under good control as high or fluctuating blood sugars raise the risk of infection and slow wound healing.

**Care of the incision**

The surgical incision should be kept clean and dry until you are seen back in the office. It is best to keep it covered with a dry gauze bandage. **BE SURE TO WASH YOUR HANDS BEFORE CHANGING THE DRESSING** to reduce the risk of infection. If there is any crust built up around the wound, you may use soapy water to gently remove it. Do not use alcohol, peroxide, or other astringents on the wound as they may break down healing tissue. Ointments like bacitracin are also not necessary any may only seal in bacteria.
The incision should be inspected twice daily. A little drainage is not uncommon in the first few days. It may be slightly blood-tinged. Excessive drainage that persists beyond 4-5 days after surgery is a cause for concern and should be seen in our office. Increasing redness, heat, swelling and fevers may be signs of an infection and should be seen immediately.

Loose clothing is preferred to prevent irritation of the wound. Shirts that open in the front are easier to put on and taken off, and facilitate dressing changes.

Some swelling and discoloration in the arm is normal. You can elevate the arm by lying flat and placing the arm over a pillow on your chest. This will allow some of the fluid to drain out of the arm.

**Showering and bathing**
You may shower and get the incision wet on the 5th day after surgery. Gently pat the wound dry and recover it. Waterproof coverings such as Tegaderm are available at some pharmacies that allow patients to shower and keep the wound dry during the first week. Full immersion underwater such as with swimming should wait until 3 weeks after surgery to ensure the incision is fully healed.

**Pain management**
You will be sent home with prescriptions for the pain medications that have proven effective for you in the hospital. They should be supplemented with Tylenol which can be taken either at the time of the pain medication or between pain medication doses. It is critical not to exceed a total of 4000mg of Tylenol daily or you could sustain liver damage. Each Extra Strength Tylenol pill contains 500mg so this would equal a maximum dose of 2 pills every 6 hours or 1 pill every 3 hours. Regular Tylenol pills contain 325mg which would equate to a maximum dose of 2 pills every 4 hours or 3 pills every 6 hours. Be aware that some pain medications such as Percocet, Vicodin and Norco may already have Tylenol in them. Check with your pharmacist if this is the case as supplemental Tylenol would risk exceeding the daily maximum dose.

Nonsteroidal anti-inflammatory can also be used judiciously in the postoperative period and are safe to take in combination with pain medications and Tylenol. These include medications like Ibuprofen, Advil, Motrin, Naproxen, Naprosyn, Aleve, Celebrex, Relafen, Mobic and others. These medications are generally safe but if taken for prolonged periods of time can cause stomach ulcers and kidney damage. It is important to take them with food and to keep yourself well hydrated. If you are taking them regularly for more than a few weeks, you should have blood work check to monitor your kidney function.

Ice can also be used in the first several days to reduce pain and swelling. It should be used in 20-minute intervals. Ice should never be applied directly to the skin or you could risk developing frostbite. Frozen peas or corn make a nice reusable ice bag that can be molded to the shoulder. After the first week or so, heat can also be used to relax the muscles and improve blood flow to the shoulder. This is a good way to “warm-up” the shoulder before exercises.

Pain medications also unfortunately have adverse effects such as addictive potential. Thus it is critical that patients make every effort to reduce their use on a gradual basis during the first few weeks after surgery. Often patients may suffice with Tylenol during the daytime and pain medication only before
bed. Patients who require routine use of narcotic pain medication beyond 6-8 weeks after surgery will be recommended to a Pain Management Practice.

Pain medications can also be constipating and cause nausea. If you have a sensitive stomach, you may require an additional prescription to suppress nausea when you take these medications. Be sure to alert the care team if this is the case during your hospital stay so that appropriate prescriptions can be written for you prior to discharge. It is also critical to prevent constipation before it happens. While on narcotic pain medications, you should eat foods rich in fiber and take an additional stool softener. These can be bought over the counter at pharmacies. If you have not had a bowel movement for a few days after return home, alert the visiting nurse or our office so that we can recommend further steps.

Sling
While at home, you may remove the sling as comfort permits being careful not to overuse the arm. When sitting, you may put the arm in a comfortable position as long as it is supported. If you are in a public area or around other people, be sure to wear the sling to alert others to steer clear of your operated arm. You should also wear the sling at night to protect the arm during sleep for the first 6 weeks.

Restrictions
Until cleared by your surgeon, you should not do the following:

- Lift more than 1-2 pounds (a cup of coffee weights about a pound)
- Swim or submerge your incision underwater
- Use your operated arm for any sporting activity, chores and maintenance type work
- Use your arm for tasks such as opening or closing doors, or other activities that involve pushing or pulling

There are a host of others that could be added to this list. It is best to take a conservative and common sense approach to using the arm in the first 6-8 weeks when tissues healing is a priority. If you have any questions about specific restrictions please call our office before taking any risks that might damage your shoulder.

Follow-up
You will be seen back at the office 10-14 days after surgery to remove staples, check the incision and the status of your exercises. You will likely transition to outpatient physical therapy following this visit. Subsequent follow-up visits are then usually scheduled at 6 weeks, 3 months, 6 months and 1 year after surgery. After that periodic x-ray checks are suggested about every 5 years after that. This ensures that if any abnormal wear or other problems occur with the prosthesis, it can be detected and followed to avoid complications. More frequent visits can be scheduled if there are any such concerns, and patients are welcome to be seen at any time if problems or symptoms of discomfort occur.
Recovery and Rehabilitation
Because the subscapularis tendon is removed with its boney attachment, the security of the repair allows immediate use of the arm for light daily activities. Patients are allowed to remove the sling as soon as the nerve block wears off and can use the arm for eating, dressing and hygiene on the day following surgery. Lifting should be kept to 1-2 pounds only for the first 8 weeks to prevent excessive stress on the repair. Depending on a patient’s progress with recovery, resumption of more strenuous activities can commence around 8 weeks. Full, unrestricted activity is allowed at 12 weeks but patients will continue to improve in strength and function for up to a year.

Home exercises
Plan on exercising your shoulder 4-5 times daily as instructed by the therapists during your hospital stay. It may be best to time sessions shortly after taking pain medications so you have the benefit of pain control during the exercise session. The aim is to gradually progress the range of motion to the limits instructed by the therapists. It is okay to stretch to the point of some discomfort but outright pain should be avoided. Use of ice after a stretching session may help reduce pain and swelling.

The following exercises are critical to achieving early and progressive range of motion.

1. **Assisted forward elevation**: this is raising the arm in front of the body. This exercise can be done by sliding the arm across a tabletop using one’s body weight to apply pressure to the shoulder. Alternatively, the contralateral arm can be used to assist in elevating the arm while lying flat on your back. The goal is to achieve 140 degrees of elevation, which is about half way between the horizontal and vertical plane.
2. **Assisted external rotation**: this is best done by using a stick or can to rotate the operated arm away from the midline of the body. The elbow should be kept tucked into the side during this maneuver. It may be best to do this lying on your back as well. This will help stabilize the shoulder blade so you do not cheat by extending the shoulder. As your range of motion progresses, you can stabilize your hand on a doorframe and rotate your body away from your hand. This should be done with gentle progressive force being sure not to rotate beyond 45 degrees or about half way between the positions of pointing to the front and pointing to the side.

3. **Pendulum exercises**: lean over and let you arm hang perpendicular to the ground. Use a gentle rhythm to swing your arm in circles clockwise and counterclockwise. Start with small circles and widen as your shoulder warms up. You can also swing it back in forth in a line.
4. **Scapular Pinches**: with your arms at your sides or in the sling, pinch your shoulder blades together.

5. **Neck Stretching**: bend your neck and try to touch your ear to each shoulder. This will help stretch your trapezius muscle. Then rotate your neck and try to touch your chin to each shoulder.
6. **Elbow Flexion and Extension**: if your arm remains in the sling for too long your elbow will get stiff and your hand may swell. Be sure to remove the sling several times daily and perform flexion and extension of the elbow. You can also rotate the forearm (pronation and supination).

![Elbow Flexion and Extension Diagram]

**Outpatient physical therapy**
Recovery of mobility, strength and function is a graduated process that follows tissue healing. We have developed comprehensive therapy protocols that are designed to limit the recurrence of stiffness and re-educate the muscles about the shoulder girdle to function in a smooth and coordinated fashion. These protocols are designed in such a way for the therapist to educate the patients about home exercises throughout the recovery process. The exercises that a patient does on his/her own between therapy sessions are equally as important as the sessions themselves, and patient adherence to this program is critical to preventing early stiffness. A properly performed home exercise program ensures that the exercises are done frequently, effectively and comfortably.

The early recovery period focuses on maintaining the range of motion achieved by release of scar tissue during the surgery. Strengthening of certain muscle may commence to a limited degree immediately following surgery. Formal rotator cuff strengthening with weights starts around 6 weeks and increases in intensity as patients continue to heal. Muscle re-education begins with light resistance exercises for the rotator cuff and the muscles that stabilize the shoulder blade.

By 3 months patients, may resume full use of the extremity provided they have achieved a functional active range of motion. Progressive strengthening exercises with increased resistance and endurance exercises like swimming, rowing, and upper body ergometer are encouraged. In addition, we strongly encourage an aerobic conditioning program for the lower extremities to promote general health and fitness.
By following this exercise program, patients are almost always satisfied with the increases in range of motion, comfort and function that they achieve during the recovery period. If the exercises are uncomfortable, difficult, or painful, the patient should contact the therapist or surgeon promptly.

**Maintenance rehabilitation**

Once the range of motion and strength goals are achieved, the exercise program can be cut back to a minimal level. However, gentle stretching is recommended on an ongoing basis as range of motion is critical to the success of the Ream and Run. In addition, a maintenance program to keep the rotator cuff muscles strong and healthy will ensure proper function of the artificial joint and may help prolong its benefit.

**Return to functional and recreational activities**

With the consent of their surgeon, patients can often return to leisure time activities at 3-4 months after their surgery. It is critical that patients achieve sufficient range of motion and strength in advance to prevent muscle fatigue and to undue stress on the artificial components. In theory, because no plastic socket prosthesis is inserted during the Ream and Run, there are no specific physical limitations imposed on patients. However, if certain high-load activities such as heavy weight-lifting or impact activities cause pain, they should be avoided. Patients should let symptoms guide their activity levels. Minor discomfort is should not cause any significant concern, but anything that causes outright pain should be avoided.

**Return to driving**

One may return to driving around 4-6 weeks after surgery. Most of the steering should be done with unoperated arm using the operated arm only to stabilize the steering wheel at the 6 o’clock position. You must be off narcotic pain medications to drive. Seat belt buckling the door closing should be done with the unoperated arm. Patients must realize that driving with a restricted arm is somewhat risky as any accident, even minor, could damage the tendon repair. Ideally, you should feel comfortable both mentally and physically before you get behind the wheel. It is sometimes beneficial to start driving at off-peak hours on roads with less traffic and less terrain to ease back into the process and ensure safety.

**Return to work**

Return to work depends on an individual's work demands. Sedentary work such as writing and keyboarding can be done as soon as one is comfortable as long as the workstation is ergonomically arranged to avoid having to lift the arm excessively to reach the mouse or keyboard. Ideally, the arms should be able to rest comfortably at the side with the elbows or forearms supported on a rest. Physical work that requires reaching, lifting, pushing, pulling etc... requires not only a healed subscapularis tendon but also recovery of motion and strength. This may take 3-4 months. In general, it is a good idea to transition back to work gradually. You may choose to work part time for a few weeks. Always commit time to do your exercises during throughout the day, particularly stretching exercises so that your shoulder does not get stiff if kept in one position for periods of time.

**How long will the Ream and Run last?**

A properly performed Ream and Run replacement will hopefully last between 10-20 years. Factors that determine the longevity of the prosthesis include age, hand dominance, physical demands
among others. The duration of comfort and function afforded by a shoulder replacement cannot be predicted in advance in any given case. Proper patient selection is critical to the long-term success of this surgery and unfortunately, not everyone is a good candidate depending on the severity of the arthritis prior to surgery. Revision surgery for a boney wear on the socket side can be performed by inserting a plastic socket if necessary.

Disclaimer
This resource has been provided by the Seacoast Orthopedics and Sports Medicine Joint Replacement Center as general information only. This information may not apply to a specific patient.