

Total Knee Replacement

Knee arthritis

Osteoarthritis is caused by old injuries, bow- legs, knock-knees and being overweight. Rheumatoid and other forms of arthritis can also damage the knee. Symptoms of arthritis include pain, stiffness, swelling, catching or locking, and lead to disabilities such as being unable walk a certain distance, difficulty getting out of chairs & climbing stairs. From a personal level it might be that you can't work, play bowls, or golf.

Non-operative treatment starts with a sincere attempt at being "Strong, Supple, & Slim". Paracetamol, anti-inflammatory tablets, activity modification, exercise, weight loss, shoe wedge and sometimes a walking stick. Before undergoing a knee replacement it's important to have a severe enough problem that the benefit of surgery exceed the risk involved. Knee replacement surgery is not pain-free!



Figure 1. This standing x-ray shows reduced joint space on the right side of the picture, indicative of moderate arthritis.

Knee replacement basics

Knee replacements are made of polished metal and plastic, these are held in place with either bone cement, or have a rough titanium surface against the bone, that the bone grows onto. Your existing ligaments will "hold it together". From a biological viewpoint, "rejection" of the implant is rare, but some people with metal allergies (eg can't wear a watch, or gets a rash from earrings) might be better with a "low allergy" version. The implant can click, but this usually settles in time. Patients expecting their new knee to be just like a normal knee may be disappointed. Knee replacements may not fully restore the range of movement if the muscles are stiff, and may still have some tenderness, so it is uncomfortable to kneel on. Full knee bend, squatting so your heel is against you buttock, takes a special, dedicated patient to achieve!



Figure 2. Biomet Vanguard knee replacement. Correct alignment of the tibia and femur - the bow has been corrected. Note-the plastic can't be seen, and the kneecap can't be seen on this view.

The plastic component of the knee replacement is manufactured by compression moulding, then gamma irradiating in an inert gas, minimizing future wear of the component. There are many orthopaedic companies on the market. Your surgeon has experience and expertise in choosing the appropriate equipment for your case.

Computers in the operating theatre

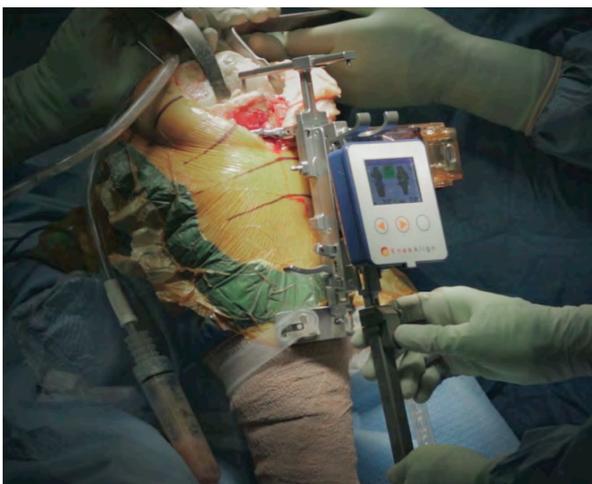
The results of knee replacement are related to how well the knee is aligned and ligaments balanced. A normal leg has a straight line from the hip to ankle passing through the middle of the knee. Arthritic knees invariably have some deformity (eg "bow-leg") and this must be corrected at the time of surgery. Surgeons have traditionally used alignment guides with a rod placed inside the femur. That technique still has a place.

Navigation

The Australian Orthopaedic Association National Joint Replacement Registry has proven improved longevity in patients under 55 where some form of computer navigation is used. Additionally, avoiding the rod inside the femur may reduce the stress on the body, improving recovery, possibly reducing post-operative confusion and blood clots.

Computer navigation has been available since 2008, using additional aiming guides inserted into the leg during the surgery, and a computer to confirm alignment. It has reasonable support in the literature, but pin sites can be a trouble, and longer surgery might increase infection rates.

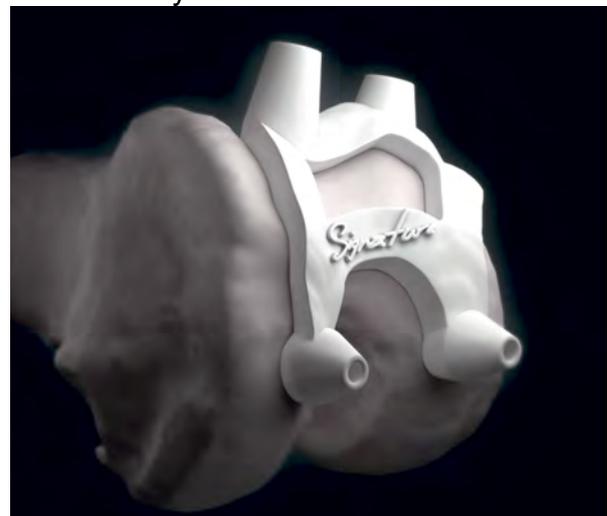
We have more experience with KneeAlign2, using it frequently since 2014. It uses smartphone accelerometer technology to locate the centre of rotation of the hip and ankle.



OrthoAlign system in use. A single use disposable device is demonstrated here aligning the tibia to ensure the cut is perpendicular to the long axis of the bone.

Patient Specific Guides

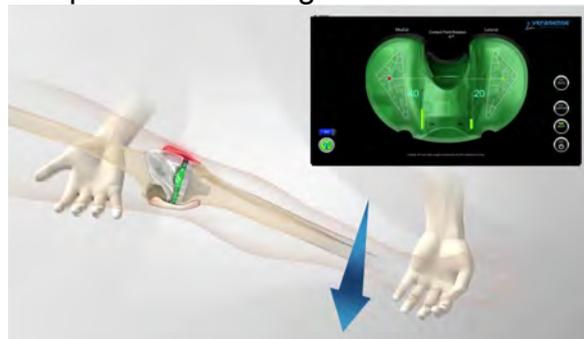
Patient specific instrumentation is based on CT or MRI images of the knee, hip and ankle being used to create three-dimensional moulds using 3D printing technology. We extensively used this from October 2009 and early 2014, and achieved reasonable results, but turned out not to be ground breaking enough to use routinely.



Patient Specific Instrumentation (PSI) Based on MRI scans, the 3D printed model provides guide holes for locating cutting blocks.

Verasense

A recent innovation is a sterile pressure-sensing computer. In real time it reads out measurements that should allow better ligament balancing. It is not yet an accepted technology that insurance companies are willing to fund.



The Verasense device replaces the trial plastic component and by putting the knee through a range of movement and stressing the ligaments. In doing so, the surgeon can measure the ligament balance and address as necessary.

Why is it better to have only one night in Hospital?

Firstly – reflect on the old days

When hip replacement was popularised around 1962, and knee replacement over a decade later, the operations were painful, and the consensus was that rest would be good for the patients. The old surgical approaches to the hip joint required the patients to use two crutches for six weeks or more. Patients were admitted to hospital often days prior to the surgery for tests and meeting other doctors involved in the care.

Two complications were particularly prominent: infections and blood clots. Antibiotics were added to the treatment, blood thinners also administered. Through the 1990's wounds were more prone to bleed, and required more dressing changes. Drain tubes were a routine part of surgery. To control pain morphine pumps were used, more recently "patient controlled analgesic systems". These required a drip to be running and oxygen administered. Urinary catheters were required in 80% of our patients in 2003, so it became routine to insert at the start of the operation. Patients were effectively tied to the bed. Immobility adds to blood clots, chest infections, even pressure sores. Urinary catheters add to urinary infections. Bleeding from the wounds required dressing changes, exposing patients potentially to other patients bacteria, even in wards where single beds are available.

A new way of looking at it

If the surgery was not very painful, the patients could get up and move. We find the first time patients get up they get dizzy, whether it is day three after surgery, or two hours. The next time they are usually fine. If they can get up and walk, they are less likely to get blood clots – in fact in the absence of a history or family history of blood clots, we virtually never see them. If the patient is comfortable, and only needs tablets for pain, there is no need for a morphine machine. No morphine machine means the patient need not be "tied to the bed", and probably won't have nausea or vomiting. We find patients are almost always independent by after lunch the day after surgery. Day surgery joint replacement is just around the corner.

If the patient is moving well, pain well controlled, not nauseated, and safe, why not go home? By getting out of hospital, the risk of being exposed to other patients' bacteria is dramatically reduced, and our lower infection rate reflects this. We do have a scoring system RAPT score to check it is plausible to go home. Scores of more than 9 will probably go home the day after surgery, 5 or less probably need to go to rehabilitation.

Perversely, the hospital is paid less for short stays, and the patients and their family need to work harder. But it is in the interest of better results to go home. Some people feel that they are being "thrown out of hospital" – no one goes home if they don't pass the checklist. By going home – less infections, and less clots.

Going to the patients own home is usually best. At someone else's house, there is a lesser tendency for the patient to get up and do things. Getting up and doing things is what we need! It is hard to check the temporary and permanent house are both safe.

Where people live alone, we'd like a friend or relative to stay the first night or two at home with the patient. Where family live next door, or within 15 minutes, even an empty house is often acceptable.



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The Process of having a knee replacement

Getting your knee fit for surgery

The greatest predictor of the final movement is the amount you had before the knee replacement! Quadriceps strength can easily be improved and helps the recovery. Our preferred timeframe is eight weeks between confirming your surgery, and having the surgery. During this time, you and a physiotherapist should work to improve muscle strength. The exercise bike is a useful tool to achieve this – both before surgery, and after. Some people can't bend their knee ninety degrees, which makes it hard to use a bike. BUT - the most common reason a bike isn't used is the physiotherapist doesn't know the surgeon.

Other health issues before surgery

Dental infections / planned dental clearance should be addressed well prior to surgery.

Unless you have already seen a physician, we may not have been fully informed of your history of angina, strokes, peptic ulcer symptoms, and recent infections. If you are aware of any health issues that may impact on the surgery – let us know!

Looking after the leg before surgery

This is important! Sometimes patients turn up with cuts and infections on the leg we are planning to operate on – and get sent home. In the few weeks before surgery, gardening or other activities where you MIGHT injure your shin should be avoided. Or at the very least take appropriate precautions (eg sturdy trousers) to avoid injury.

Physician Assessment

Physicians are doctors specializing in adult internal medicine, like I specialize in orthopaedic surgery. Most patients having a knee replacement will not need a

physician unless they have other serious health issues.

Getting your house ready for going home

- Remove unnecessary mats & rugs
 - More space around furniture to allow easier mobilising with crutches
 - Raised toilet seat & hand rests
 - Handrails in shower
 - Sitting options include carver chairs
- The pre-admission clinic will go over these again to check all is well.

Pre-admission Clinic SJG

At St John of God Hospital, most patients attend the pre-admission clinic to ensure all the required tests have been done and that you are familiar with the hospital, and its layout. Sometimes this is arranged by telephone alone.

Preadmission clinic - Ballarat OSM

Please bring anyone who will have an opinion about you going home after surgery. We write your in-hospital medication chart, go through our checklist, and advise any medication changes prior to surgery. We will give you a bottle of Powerade to drink on day of surgery, and a Somac prescription if needed.

What to bring to hospital

You will only be staying briefly, so don't bring too much. Wear to hospital the clothes you will wear home.

Nightgowns and shortie pyjamas allow for easier access for dressings / bandages / having the wound attended to & topped up with local anaesthetic agents. A second set of night attire allows for any blood ooze through the dressing. Bring some magazines, but don't bother with laptops. A mobile phone has both negatives & positives. Aim not to bring any jewellery.

Admission to hospital

Typically patients are admitted on the day of surgery to the hospital through the Surgical Admission Unit. Same day admission has successfully reduced the risk of post-operative infections. You will be advised when to "fast" from prior

to admission, it is important to have an empty stomach for safe anaesthesia. No solid food is permitted for six hours, but clear fluid like Powerade, 2 hours.

Anaesthesia

The best anaesthetic overall is a combined spinal and general anaesthetic. This is used in conjunction with local anaesthetic infiltration to ensure minimal pain. The anaesthetist will meet you before you go to the operating theatre to discuss any concerns. If you are a high-risk patient, it may be appropriate to meet the anaesthetist some weeks prior to surgery.

Recovery room

Typically you will wake up in the recovery room, adjacent to the operating theatre. The nurses there closely monitor you. Ice packs will be applied to your knee and you'll get an icy pole to suck on. **They might ask you "do you have any pain?" – unless very uncomfortable – you should answer "NO" or "minimal".** If you wish to speak to your surgeon – say so, rather than saying you have pain! The recovery nurses have a protocol allowing them to give you A LOT of drugs if you say you have pain. These drugs may make you feel sick or vomit.

Tubes

We aim to have the minimum number of tubes connected to you. The drip can be removed a few hours after surgery, but the "cannula" left in to give antibiotics. Oxygen is usually removed if your "saturations" are >94%. We only put in a urinary catheter if it seems likely you will have trouble voiding.

Orthopaedic Ward

You are moved to the ward on your bed. When you are alert, start getting some Powerade drink into your stomach. The nurses will check on your leg and get your knee more ice packs. A light diet

only for the day after surgery is recommended.

Physiotherapy

Typically our intention is to have you out of bed on the day of surgery to minimize the risk of chest infection and blood clots. The physiotherapist will be there probably the first time you get up, then just the nurses. 95% of people are independent by 24 hours from surgery. Walking aids may start with a frame, and changed to using two crutches as soon as possible. Some people use only a walking stick at discharge from hospital.

Post-operative aims for recovery

First time up	2 hours	(2-24)
Independent	16 hours	(8-48)
Discharge home	1 day	(1-4)
Inpatient rehabilitation	<5%	
Outpatient physiotherapy	20%	

Getting on with recovery

There are three things to getting good knee function after a knee replacement. It needs to go **straight**, it needs to **bend** and you need to **walk**. Whether you are home or in hospital, these three things YOU need to do. You need to take enough painkillers to achieve all three of these.

Walking

Our intention is to start you walking on the day of surgery. At the very least, standing or sitting briefly on the edge of the bed allows your body to adjust to being vertical again. We find that people walk MORE if at home than in hospital.

Getting the knee straight

Usually a pillow is placed behind your ankle when in bed. This is so the knee rests fully straight. DO NOT put a pillow behind your knee, as this has the opposite effect. There are very limited circumstances a pillow may be used behind your knee. You are permitted to sleep on your side or any position comfortable.

Getting the knee to bend

This is not as important in the first two days, and indeed may cause the knee to swell excessively. It is OK to bend the knee to get out of the bed or chair. After the first two days, we are keen for you to make the knee bend. This happens fairly easily but some patients need to do additional exercises after the first three days to get the knee going.

Bending 90	5 days
Bending 110	12 days
Bending 120	6 weeks
Bending 135	6 months

Do I need to go to inpatient rehabilitation?

The majority of people DO NOT need inpatient rehabilitation. We have found that even people over 80 years old are fit to go directly home by day 4 – if there will be someone with them. We use a system called RAPT score to assess you'll be OK.

Going to a friend's house is not always ideal. It may not have a rail in the shower to hang on to. Preferably the shower can be walked directly into, rather than needing to step into a shower/bath.

Going Home

Tablets & things to take home

You will take home some tablets – some as background painkillers, and some to top up with if you have significant pain. Scissors will be provided for you if you need to remove the bandage. Also, a spare dressing and tubigrip (to pull up over the knee) is supplied.

Older patients may need a raised toilet seat, handrail in shower and better sitting options such as carver chairs. Younger, stronger patients often don't need any special aids.

Living Alone?

Everyone is best to have someone stay with them for the first night. You will

need to stock up the freezer before going to hospital, and someone to check on you daily (bread/milk/newspaper etc). Obviously if the corner shop is an easy walk away, you can do this quite soon after the surgery. A Safety Link necklace could theoretically be used for a couple of weeks after the surgery.

Back up plan

A key part to going home is that you can call help if there is a problem. In hours you can call the surgeons rooms on 5332 2969. Out of hours you can call the St John's Orthopaedic Ward on 5320 2140, or the Ballarat Base Hospital ward on 5320 4640. Your surgeon may have given you his mobile number on card or discharge instructions.

Most problems only require advice, but perhaps one person per year needs to go to the emergency department.

Bowels

Constipation is a problem best avoided by eating plenty of fruit and walking frequently. Avoid Panadeine Forte, a common painkiller, although all painkillers can do it. Prune or cloudy pear juice is a classic remedy and probably should be taken on day two (ie Saturday after a Thursday operation). If your bowels haven't worked within three days of surgery please seek advice from your local Pharmacy. If they still haven't worked the next day – contact your surgeon.

Pain or discomfort

Different people have different amounts of pain. If the knee is painful at night, take Tramal before bed. If this isn't enough, phone your surgeon. Typically, Amitriptyline or Lyrica is prescribed if you still have pain after two weeks.

The bandage.

At the time of surgery a firm multi-layered bandage is used. This should stay on for at least 24 hours. If you have a long distance to drive home the bandage may stay on until you get home. The bandaging often has some blood soaked into it, sticking the layers together. The easiest way to remove

the bandaging is to cut it off with a pair of scissors. I recommend doing this in the shower recess on a plastic chair. If the dressing is leaking blood out the edge, remove it, shower, and pat the wound dry. Put the new dressing on. It should not need changing again. Some scissors have a blunt tip – this is the side that should be against the skin! The underlying plastic dressing usually stays on (it can be changed) and a tubigrip pulled on to give some compression.

What will the leg be like?

The knee will be swollen and bruised underneath the bandaging. When the bandaging comes off there will be indentations from the bandaging, rarely red patches or few blisters.

The edges of the wound are usually a bit pink for about a centimetre – this is normal healing and not infection. The knee will be warm, even hot – as part of the healing reaction. Ice packs (or frozen peas) are very helpful in the first week.

The bruising becomes more evident during the week - but sometimes doesn't turn up until 7-10 days with a yellow bruise at the ankle. Some tenderness along the shin may occur as the bruise makes its way down.

Bending the knee is difficult at the start. The thigh muscle feels weak and you may require crutches to avoid falling until you have your strength. The swelling can get worse over the first week- this is normal.

The knee typically will have some areas of numbness at the front – this gradually gets better. The swelling & heat in the knee typically stays for 3 months, it may take 12 months for the swelling to go.

First week:

Take the Panadol four times a day, Mobic 7.5mg twice a day, & Aspirin

(Cartia 100mg) once daily. Leave the Norspan patch on until the staples are removed.

You should walk every hour when awake. When not walking, you should put your leg up – the lounge suite is best.

You should do bending exercises. Sometimes the other leg can be used to help make your operated knee bend.



Passive flexion exercises (diagram) using the hamstrings of the good leg to bend the operated side

Second week:

You should walk every hour. You probably will only need a walking stick. When not walking, you should put your leg up. The swelling is usually at its worst about a week after the surgery.

Once the swelling is at its worst – bending every day will see it getting better every day. Aim for 100 degrees for the day the staples are due out, back off for a couple of days, then aim for 110 degrees at the end of the second week. The metal staples holding the skin together are removed at about 11-16 days from the surgery.

Third week

Exercise bike – get strength & more flexion back. Might need to start off with the bike seat high for 5 minutes, then slightly lower the seat for 10 minutes. Aim for 2-3 times per day.

More aggressive bending exercise

Historically only 50% of people achieve kneeling in Western societies after knee replacement. Whether or not you want to kneel, we would like you to commence an exercise at three weeks from surgery. Putting the operated knee and the front of the shin to the ankle on a well padded chair or bed, and trying to “sit on your haunches”. This is also a VERY good way of pushing the flexion range.

Starting kneeling

Kneeling requires strength, range of movement, and a lack of tenderness, and also bravado. The kneeling exercise on a chair helps with the range of movement, tenderness and confidence. To kneel on the floor – for the first few times (at six weeks for instance) it is wise to do it on a carpeted floor or on a cushion, and to have a bench to push up on. An “EasyKneeler” is useful in the garden.



Kneeling on a padded chair after the wound has healed twice a day desensitises the skin, and might improve knee bending range. This image is with the knee at about 95degrees of flexion, about 70% of the full range. In thin people who weren't too stiff prior to surgery, some can achieve 135degrees of flexion at one year.

Resuming Life!

Knee replacement surgery aims to improve your pain and disability. Now you've had it done, you should get on with life.

Walking up and down the street should be undertaken as soon as possible, probably the day you go home from hospital. Then you know you can do it, and know that you will be able to do a bit more the next day.

Some people feel they should stay inside their house – this makes no sense. We would rather that you walked every hour to help to reduce the swelling of the calf.

Obviously the first time, someone should be with you. A mobile phone with you is best.

In short, it is possible to resume “life” as soon as you go home. If you want to tinker in the shed, fine. If you want to cook, fine. If you want to go and visit a friend, fine. If you need to take a tablet to achieve these things, fine. It is better to be active, although prolonged standing still should be avoided.

Sleeping

You may sleep in any position in bed except with a pillow under your knee, the knee will become harder to get out straight as a result. Usually the Tramal helps you sleep if pain is the issue.

An occasional patient can't use Tramal. Endone isn't great as it wears off during the night. About 5% of people have pain or disturbed sleep enough to use Endep 10-20mg at night, or Lyrica 75mg twice a day.

Driving after Knee Replacement

There is a recommendation from the Arthroplasty Society of Australian that patients cannot drive for six weeks after surgery. In truth – some patients shouldn't be driving BEFORE surgery because of eyesight, or motor skills. Our research has demonstrated that patients reaction times are in acceptable range sooner than this.

It is reasonable to drive sooner if:

- You are walking without crutches
- You are not using strong pain killers
- You drive an automatic and left knee had the surgery

When you start driving you should:

- Have mobile phone turned off
- Have radio/music turned off
- Start with short distances
- Avoid peak hour traffic
- Avoid tailgating – your reaction times may be off & this could translate to 50m more stopping distance.

When will my knee be normal?

Knee replacement is a major operation. It is basically right at SIX MONTHS from surgery. It will continue to improve until 3 years, but even by three months it should be better than pre-operatively.

A small number of people are never satisfied with their knee replacement. These fall into the categories of wrongly selected for surgery, wrong expectations of the patient, complications, and a group where no reason is ever found.

What to ring us about...

Nausea / vomiting

Constipation not fixed by three days

Black bowel motions

Increasing redness or discharge from the knee

Avoiding Sources of Infection

Dental Procedures

Some dental work is particularly risky for getting infection into a joint replacement. Dental infections can get into a joint.

The most common recommendation is to take 2-3g of amoxicillin one hour prior to procedures where there is a risk.

(Aust. Dent J 2005:50 Suppl 2S45-S53)

Skin wounds

Rose thorns, shin cuts, and open foot injuries are all high risk. Gardening is somewhat hazardous. The risk never completely goes away. Gardening gloves are essential and long sleeves add safety for pruning. Mowing should be done in trousers.

Pain Management after Orthopaedic Surgery

Pain scores & Discomfort

Nurses in recovery and the ward will ask you whether you have any pain, and to score it out of ten. If you can get basically comfortable by moving yourself, the score is probably 2 or less.

It is important that you tell them if the pain is somewhere different than where the operation site!

Most patients look comfortable in recovery. But if you report pain at 5/10 you are likely to get morphine like injections, which might trade the pain for nausea. At 7/10 people are visibly in pain – teeth clenched, pale appearance, sweaty brow. 10/10 pain is rarely seen and described as “screaming pain”

Local Infiltration Analgesia

This is a key technique that we are expert with in Ballarat. Local anaesthetic mixed with anti-inflammatories – Torodol & dexamethasone is infiltrated around the wound by the surgeon. The surgeon leaves a wound catheter buried in the bandaging so that extra drugs can be injected around the joint replacement the following morning. It has a filter on it to avoid any contamination.

Pain Patch.

Norspan, a narcotic patch, is applied to the skin and gradually releases analgesia. If the patch is too hot, you may become nauseous or drowsy. If your joint is sore you can warm up the patch by giving it a rub, or put on a jumper. The Norspan patch is typically changed 6-7 days after surgery.

Background tablets

Mobic
Panadol
Somac

Top up medications

Tramal is the preferred drug. Typically 1-2 tablets, 4 hourly as required. Tramal is not always perfect, it can cause nausea or hallucinations, and can't be used with high doses of some anti-depressants. It seems more effective and less habit forming than Endone.

Swelling control reduces pain

Rest means not bending it too much in first two days. It is still permissible to walk and exercise your feet up and down.

Ice packs are first applied in recovery, or as soon as possible after the surgery. Be a little careful with areas that have local anaesthetic that you may not be able to feel how cold it is. Do NOT apply ice directly to the skin, and apply it only 20 minutes at a time.

Compression is initially a bulky bandage extending to the foot. This stays on for a minimum of one day. It is then replaced with Tubigrip, and a Venosan stocking.

Elevation. In the first two weeks, put your leg up when you can. Lying on the couch is much better than sitting.

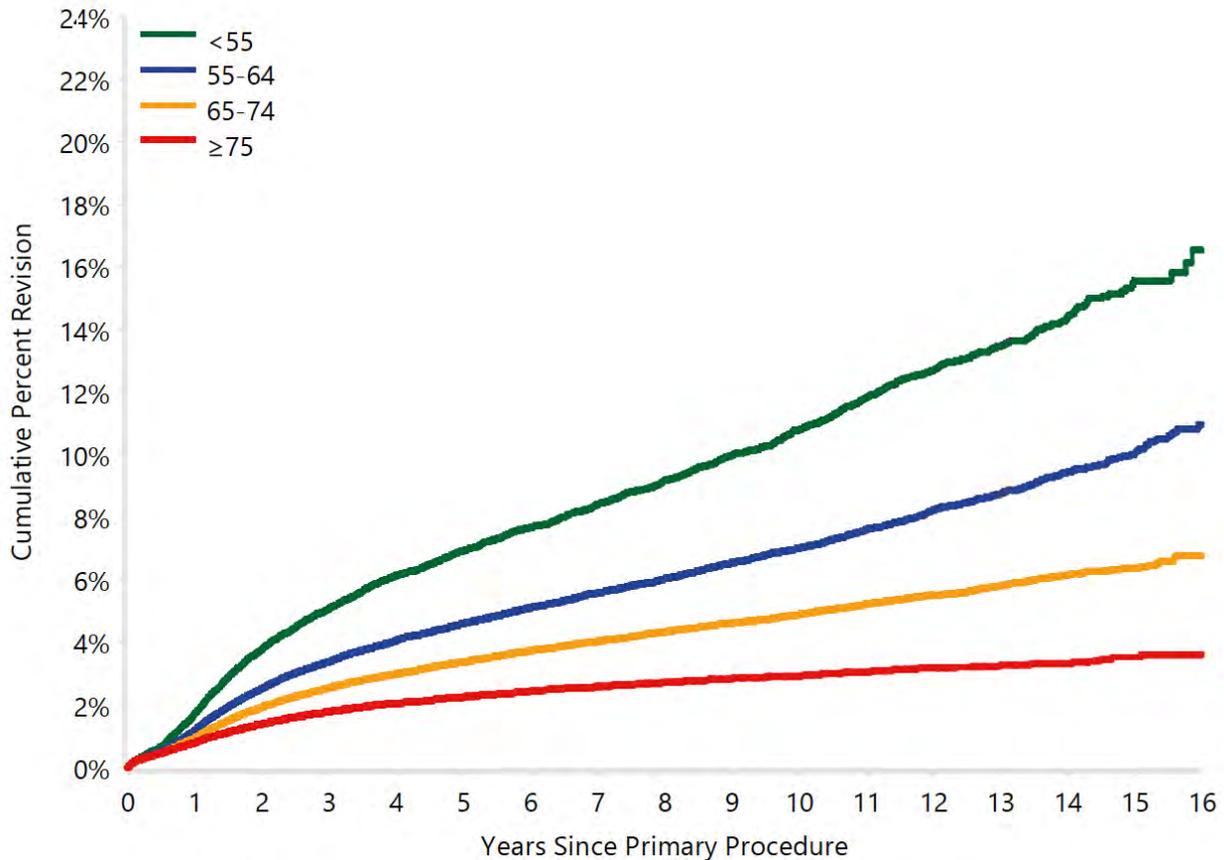
Avoiding nausea and vomiting

Our aim is to have you drinking fluid and food as soon as possible after the surgery. We generally try to avoid fruit juices for the first day as these sweet & acidic drinks can make you vomit. Powerade is a sugar & salt drink – this can be used up to two hours before surgery, and when you are alert after surgery. If you feel sick tell the nursing staff. It is easier to control nausea early, rather than allowing vomiting.

Night pain & Chronic pain

If pain prevents sleeping it needs treatment to avoid becoming chronic. Amitriptyline 10mg at night, increasing to 20mg may suffice. It is described an anti-depressant, but in this instance it is prescribed in a comparatively small dose that helps with "neuropathic pain".

Revision Surgery Rates after Total Knee Replacement



Joint Registry Data

All joint replacements in Australia go into a central registry allowing surgeons to monitor the success of implants and specific techniques. It has been shown about 2% of knee replacements fail in the first two years, then 0.5% per year. The biggest factor in revision surgery is age. Men under 55 have a 12% revision rate at 10 years and this group should have done everything in their power, weight reduction in particular. The most common age group is 65-74, has a better 5% revisions at 10 years.

Patella Resurfacing Does Better

Some surgeons routinely resurface the patella with a plastic liner. This reduces the re-operation rate by 1%. Because wear of the patella component occurs, and reoperation difficult, surgeons sometimes leave it as is, especially in younger patients.

Minimally Constrained Does Better

The surgeons at Ballarat Orthopaedics all use minimally constrained implants as the usual design. Some other surgeons remove the posterior cruciate ligament – the Australian Joint Registry data indicate that minimally constrained designs perform better. The posterior cruciate is typically removed with revision or re-do operations.

Low Risk Knee Replacement.

Using the above factors, using highly cross linked polyethylene, and using computers to align the knee replacement all reduce the risk of revision. A 2018 study from the AOA National Joint Replacement Registry demonstrated if all factors are used, the revision rate is 2.9% at ten years, vs 6.9% if they are not used. Insurance companies don't fully fund all the technologies we'd like to use.

Complications following knee replacement

A knee replacement is a major surgical procedure with serious complications. This list cannot be complete, but does deal with more common problems. Accepting and minimizing these risks is a responsibility of both the patient and the surgeon. We aim to control all the risks, and only extremely rarely do patients regret undergoing a knee replacement.

Skin loss & wound healing issues

We have had about 1 in a hundred people that have had a small area of skin loss over the front of the knee. None so far have required skin grafting, but dressings have been necessary and it is hard to get the full range of movement of the knee.

Scar pain and numbness

The knee replacement involves cutting a number of layers to do the surgery. It is common for an area on the outer (lateral) area of the skin scar to be numb. The area may become smaller with time (years) but it is usually permanent. For total knee replacements, where a long incision is required anyway, I put the scar further towards the outside of the knee. Using local anaesthetic should also reduce the risk.

Scar tenderness

The scar is expected to be tender for three months. The scar is not perfectly flat and takes some months to smooth out. The obvious scar is not the only one, deep layers are usually cut on the inner aspect of the kneecap and this will be tender for some months. Rubbing cream into the scar and the skin at the front of the knee helps.

Stiffness

Knee replacement does not guarantee a normal range of movement of the knee. This is typically most obvious when trying to put on a shoe or sock, climbing stairs, or getting into a car. Less than 90 degrees of bend will be very disappointing to both the surgeon and the patient. Pre-operative training, pain management, and patients working hard minimises the risk.

Urinary catheterisation

Sometimes the bladder doesn't function normally after an anaesthetic. A tube is placed in the bladder to rectify this – it is usually left in for 1-2 nights. Rarely, there is a problem that a Urologist is required to fix with surgery.

Thrombosis & pulmonary embolism

Clots can occur within the veins of the leg and pelvis before, during or after surgery. Clots dislodging move up to the lung and can be fatal. Even if they remain in the leg, a “post phlebotic syndrome” can leave permanent swelling of the leg and can cause ulcers to develop. Our standard approach is compression stockings, aspirin, and early mobilization. If you, or a family member, have had a blood clot before, you **MUST** tell your surgeon to ensure additional steps are taken if required.

Infection.

Infections can occur directly after an operation, or even occur out of the blue many years later. The infection rate is quoted as 0.2 to 2%. Some patients may carry additional risk factors – tell us you have been exposed to MRSA or a bad staph infection. Diabetes, obesity, malnutrition and cigarette smoking can all contribute to infections. To minimize the risk of infection, we prepare the operation site with antiseptics, use antiseptic impregnated drapes, and use intravenous antibiotics at the time of and after surgery. At SJG & BDPC we have ultra-clean air operating theatres, and we use “space suits”. Following knee replacement you must tell doctors & dentists before any procedure.

Infections invariably require extensive surgery, and prolonged antibiotics. Some alternate reconstruction such as arthrodesis, or even amputation needs to be considered.

Bleeding from the stomach

We have seen this in patients who probably had an undiagnosed stomach ulcer prior to their knee replacement. Where a risk is perceived, Somac is given. There is clear evidence that Mobic used in combination with Somac has virtually no risk even with a history of stomach ulceration.

Neurovascular injury

Passing around the knee are nerves and arteries supplying the lower leg. Injury to these can result in permanent loss of function or viability of the limb.

Bowel obstruction

Pain relieving drugs such as morphine can slow the gut action. On occasions the gut gets worse, becomes distended and may require surgical treatment! This is usually a “pseudo-obstruction” and occurs in 0.5% of cases. Since using our local anaesthetic cocktails, we haven't seen this problem.

Fracture

A fracture of the tibial shaft can occur at the time of surgery, or after an injury. Fractures of the femur can occur just above the knee replacement. Either way, both may require surgery and a prolonged recovery period.

Complex Regional Pain Syndrome

This rare diagnosis (previously known as Reflex Sympathetic Dystrophy) contributes to poor outcomes with pain and stiffness. If you have ever had this condition diagnosed in you, tell your surgeon so additional steps can be undertaken to minimize the risk. Our techniques of local infiltration analgesia and postoperative pain management minimize the risk of it occurring with this operation.

Dislocation

Knee replacements rely on your ligaments. In extremely rare cases, if ligaments fail around the knee, the

femur and tibia may dissociate. Obviously we have solutions to the problems, but it is unlikely the knee will be returned to normal.

Loosening

For a variety of reasons, the fixation between the knee replacement and the bone may fail. This loosening may cause pain and require re-operation. An average re-operation is unlikely to be as good as an average first time operation.

Wear

The plastic insert between the femur and tibia can wear. Typically the wear rate is in the vicinity of 0.04mm per year, so most people will never have a problem from this. Rare cases though may wear faster and require further surgery.

Extensor Complications

The patella (kneecap) like other bone is alive, with a blood supply. Rarely, this dies, and can cause it to break into pieces. This might need surgery, that surgery may not be particularly successful. The tendon above or below the patella could rupture. The patella component could loosen. Surgery is recommended for each of these problems.

Dexamethasone

We administer this to help with pain & nausea after surgery. So far we haven't had anyone “manic” or have avascular necrosis of their hip, but these are known risks.

Renal failure

To minimise pain after the surgery we use anti-inflammatory medications. Patients that have had renal failure previously are at particular risk. Dialysis was required for a week in one such patient, although it was not an elective case, nor a knee replacement.

Stroke

A stroke occurs in 0.2% of patients, causing possibly permanent weakness, and one in four die as a result. This risk is reduced as we administer aspirin as part of our blood clot reduction strategy.

Surgical team

There might be 150 steps to getting an operation just right. The surgeon is responsible for every step. Some steps are delegated to nurses, administrative staff, and the orthopaedic fellow. The fellow is a fully trained orthopaedic surgeon in his own right, but chooses to work with your surgeon to learn and copy his technique. All critical steps are performed under direct supervision, or performed by the surgeon. Whilst possible to request your surgeon to do every intra-operative step, this would have a larger out of pocket expense. Your surgeon's reputation is based not only on his own skill, but that of the whole team!

Arthrodesis

Knee replacement surgery is aimed at restoring a strong hinge at the knee. There are circumstances where this is not possible - infection, or loss of the extensor mechanism (quadriceps, patella, and patella tendon) may mean it is not possible to achieve the normal outcome.

Arthrodesis is an operation to fuse the femur (thigh bone) to the tibia (shin bone) so that they function as a single bone. This may help overcome the problems mentioned above. Perhaps 1/2000 knee replacements end up in this category.

Amputation

This is a very rare outcome of knee replacement. However, the combination of severe sepsis and knee replacement infection could see it occur. Infection and the loss of the extensor mechanism could see it as a reasonable solution. If there is severe arterial disease, the blocked arteries could be the main reason it is considered.

The surgeon's job includes minimising the risk, but it is hard to make the risks zero.

Other

It is not possible to provide a full list of complications. Some patients are unhappy even if nothing can be identified as being wrong with the knee replacement. In these circumstances, it may be better for the patient to make the "best of a bad lot" rather than have more surgery.

17th November, 2019
TKR v 10.7

What is included in the cost of Joint Replacement?

Insurance generally pays for the “spare parts” and most of the hospital expense, but only covers a fraction of the doctors’ fees. This is because Medicare hasn’t adjusted their schedule to match CPI since 1983, or at all since 2014, Medicare is now worth less than one third of the real value of 1983. So there will be out of pocket expenses for doctors.

Doctors involved in the operation are: the surgeon, anaesthetist, surgical assistant, and if any medical problems occur, or are anticipated, a physician. The surgical assistant is a skilled nurse, doctor, or surgeon or a combination of these working alongside your main surgeon. The surgical assistant’s billing will occur through Ballarat OSM. Typically there will be an out of pocket expense, which contributes to paying the salaries of our nurses and our fellow. If a physician is required, please discuss his fees with him. The anaesthetist will arrange his/her own financial consent. Typical out of pocket expense after Medicare & private health insurance rebates (estimates) are \$500 for hospital, \$400 for anaesthetist, and \$400 for surgical assistant.

Included in the **surgeon’s fee** is performing the surgery, follow-up in the hospital and consulting rooms for twelve months is usually bulk billed - ie no additional charge to you. The surgeon takes responsibility for the whole process, and to solve whatever problems occur. The surgeon takes personal responsibility for the post-operative pain control –including extensive local anaesthetic infiltration around the wounds. For patients off track, the surgeon intervenes, or supervises interventions. The surgeon takes personal responsibility for achieving a low infection rate. If an infection does occur, aggressive surgical and antibiotic treatment is required.

The AMA calculates annually the change in cost of medical practice, covering practice staff, insurance, rent etc, which roughly follows the CPI. Following the AMA fee suggestion, the surgeon’s fee for major joint replacements & the reinjection technique is \$4099 (item number 49518 & 18222). Insurers are only required by law to pay \$339 towards the surgeon, Medicare pays \$1017, thus you’re \$2815 out of pocket, for the surgeon. Insurers require us to discount by 25-35% to allow "Gapcover" arrangements, even with moderate out of pocket expenses.

ESTIMATED COST	Insured patients	Medicare only insurance	No Medicare
Surgeon	\$ 3,000	\$ 3,648	\$ 4,354
Total	\$ 4,270	\$ 18,300	\$ 20,000

Included in the package of estimated fees are:

- Hospital, surgeon, assistants, anaesthetist, prosthetic implants
- post operative ward rounds, usual blood tests and XRs
- followup phone call(s) after discharge, access to Ballarat OSM nurses for advice
- 2 & 6 week appointment at rooms, and any other visits to the consulting rooms required.
- 12 months follow-up appointment related to the knee
- Long term surveillance of the knee replacement by XR & phone for younger patients

Excluded:

- Physician involvement
- Other orthopaedic or surgical problems

If you are experiencing personal financial hardship, please discuss this well prior to the surgery so an amicable arrangement can be made. Note that most our joint replacements patients are elderly and many have a part pension. The out of pocket expenses will be required to be paid two weeks prior to surgery to avoid cancellation.