



# Training Clients with Knee or Hip Replacements

# Dan Ritchie, PhD, CSCS

16+ years experience – personal trainer,  
manager, owner

Certified Strength and Conditioning  
Specialist

FallProof Balance and Mobility  
Enhancement Specialist

Enhance Fitness Master Trainer

2014 PFP Personal Trainer of the Year

Act!vate Brain and Body Advisory Board



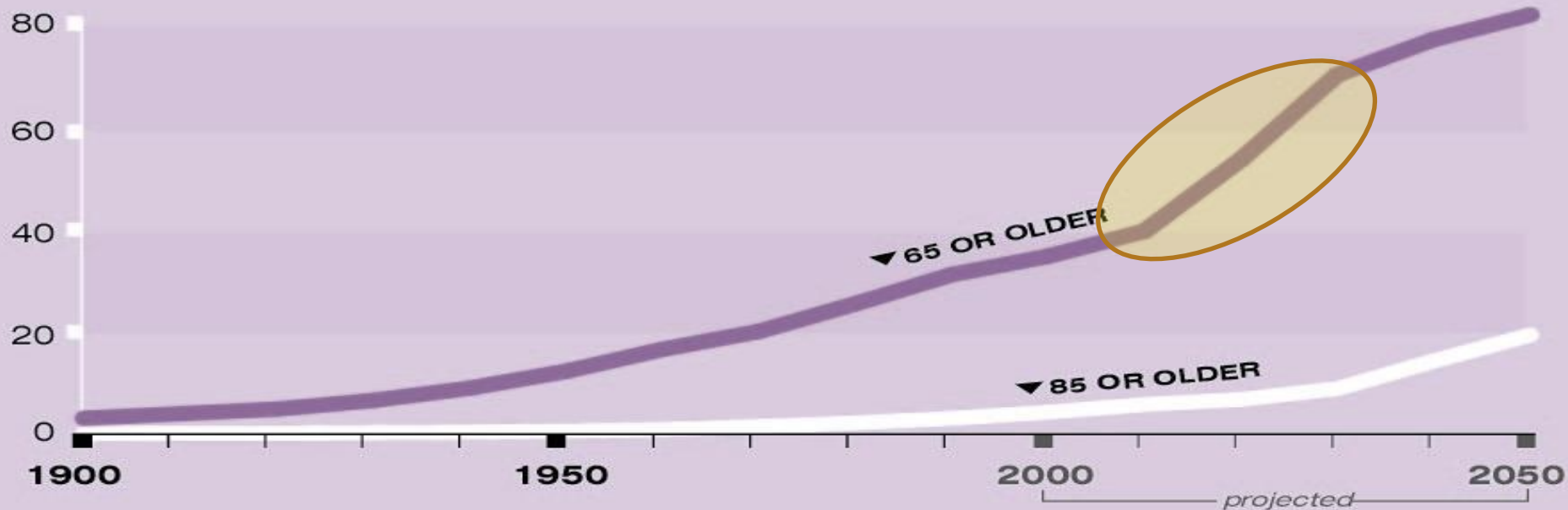
FAI

# FAI International Advisory Board



# Huge Growth means Huge Potential

**Total number of persons age 65 or older, by age group, 1900 to 2050, in millions**



Note: Data for the years 2000 to 2050 are middle-series projections of the population.

Reference population: These data refer to the resident population.

Source: U.S. Census Bureau, Decennial Census Data and Population Projections.

# The Mature Market by the Numbers

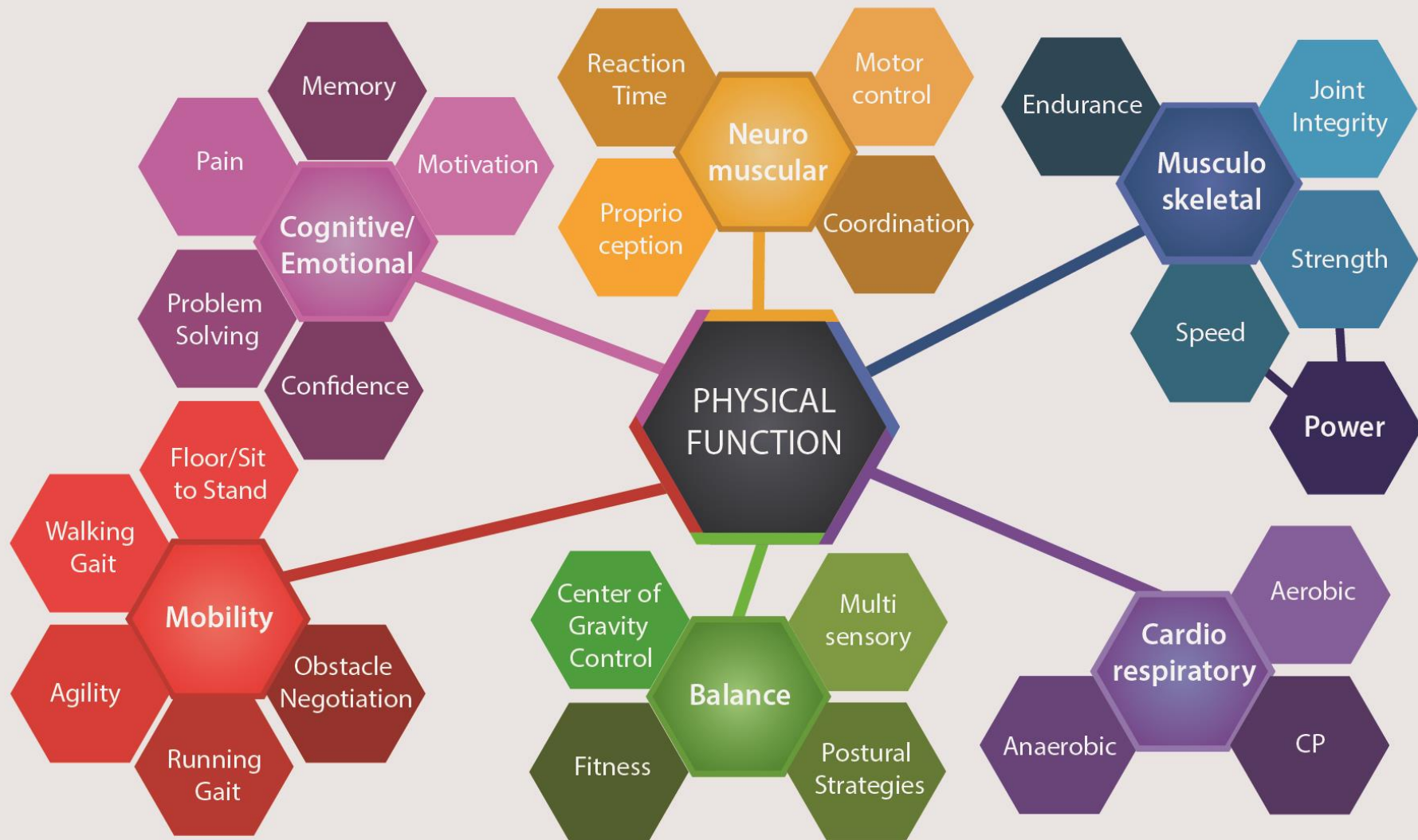
**1946-1964**

Currently Age 53-71

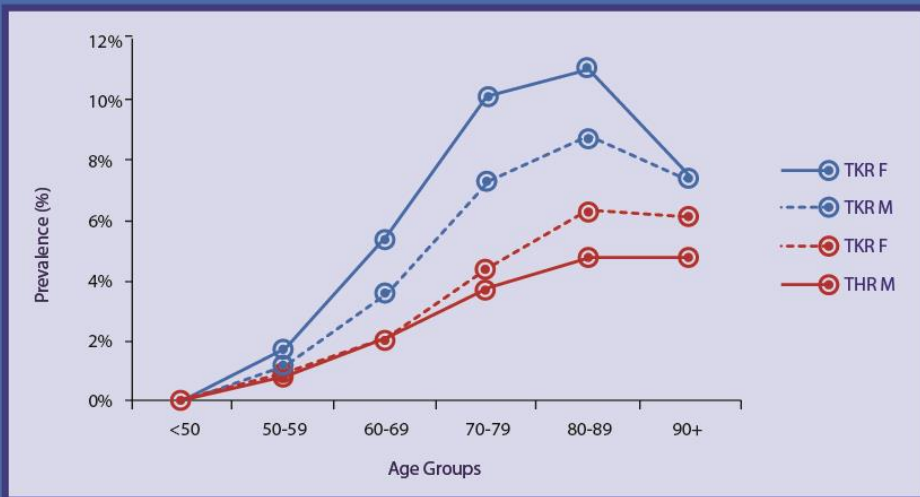
76,000,000+

Every 7 seconds

FAI



# 7.2 Million living with knee or hip replacements



## Knee arthroplasty data

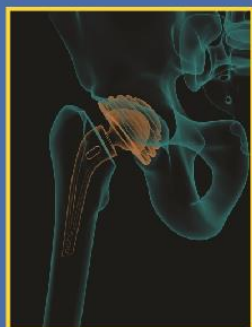
An estimated 4.7 million Americans have undergone total knee arthroplasty (TKA) and are living with knee implants, according to the pioneering prevalence study presented by Mayo Clinic in March 2014.



## Hip arthroplasty data

An estimated 2.5 million people have undergone total hip arthroplasty (THA) and are living with hip implants, according to the pioneering prevalence study presented by Mayo Clinic in March 2014.

### Total Hip Replacement (THR)



| Age Group | Female | Male |
|-----------|--------|------|
| <50       | 0.1%   | 0.1% |
| 50-59     | 0.8%   | 1.0% |
| 60-69     | 2.1%   | 2.1% |
| 70-79     | 4.4%   | 3.8% |
| 80-89     | 6.3%   | 4.8% |
| 90+       | 6.1%   | 4.8% |



**2.5 Million** (1.4 Million Women, 1.1 Million Men) individuals with total hip replacement in 2010

### Total Knee Replacement (TKR)



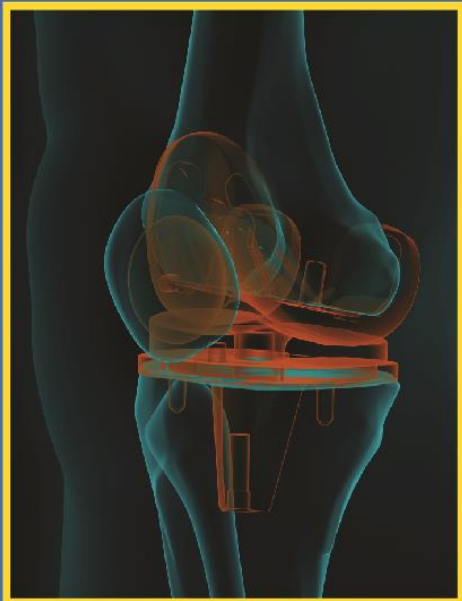
| Age Group | Female | Male |
|-----------|--------|------|
| <50       | 0.1%   | 0.1% |
| 50-59     | 1.8%   | 1.2% |
| 60-69     | 5.5%   | 3.6% |
| 70-79     | 10.1%  | 7.3% |
| 80-89     | 11.0%  | 8.8% |
| 90+       | 7.4%   | 7.4% |



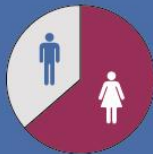
**4.7 Million** (3.0 Million Women, 1.7 Million Men) individuals with total knee replacement in 2010



## Total Knee Replacement (TKR)



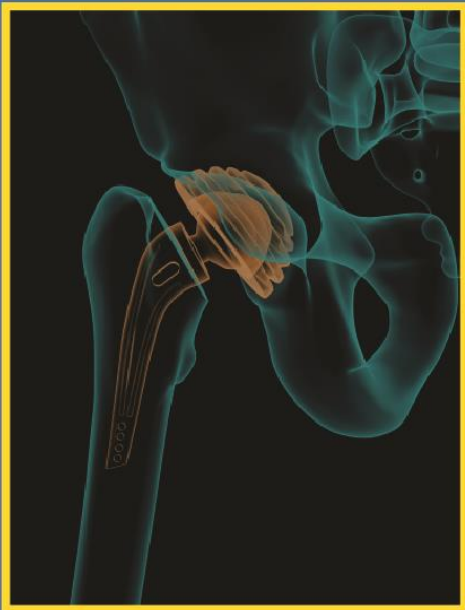
| Age Group | ♂<br>Female | ♀<br>Male |
|-----------|-------------|-----------|
| <50       | 0.1%        | 0.1%      |
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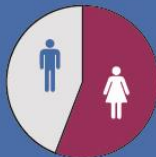
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## Total Hip Replacement (THR)



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**2.5 Million** (1.4 Million Women, 1.1 Million Men) individuals with total hip replacement in 2010

# TOTAL KNEE REPLACEMENT

## Indications



Osteoarthritis affecting 2 or more compartments of the knee Other forms of arthritis eg rheumatoid

## Age group



Generally over 40 years

## Incision length



12-15 cm

## Post op recovery



More painful and home generally within 5-7 days

## Blood loss



Significantly more blood loss - Blood transfusion rate 25% (highly variable)

## Back to work (office)



6-12 weeks

## Survivorship of implant



80-85% @20 years

## Range of movement of knee



rarely full range. Usually around 120 degrees

## Function



Most daily activities possible but knee feels

## 3.5 MILLION

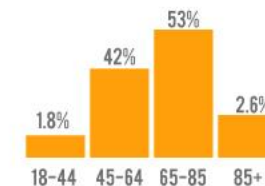
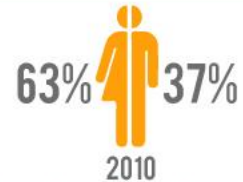
Predicted annual demand for knee replacement surgeries by 2030

## 1968

year the first knee replacement surgery was performed.

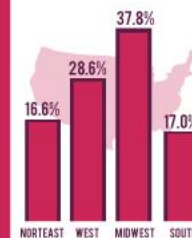
## KNEE REPLACEMENT SOME STATS

### BY GENDER



### BY AGE

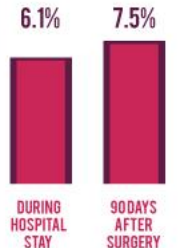
### BY REGION

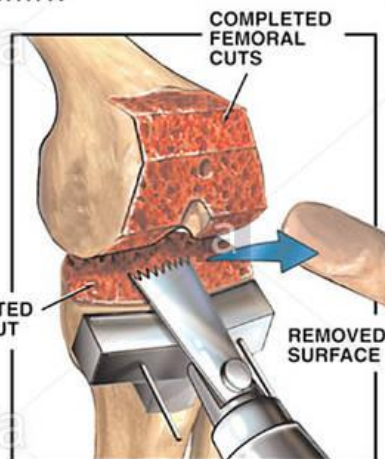
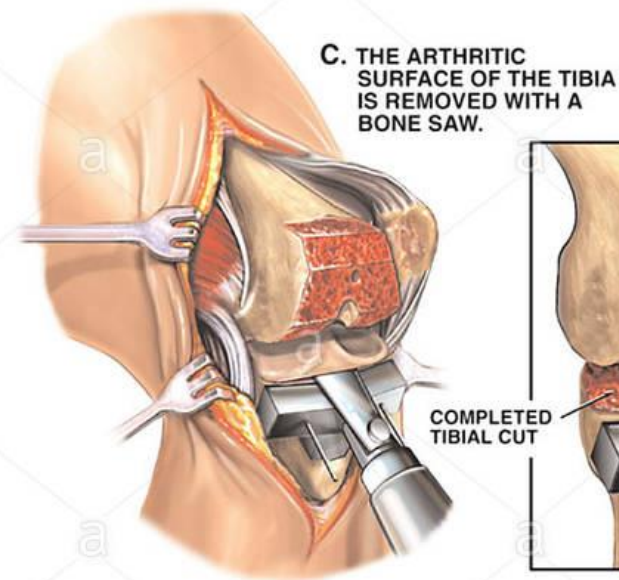
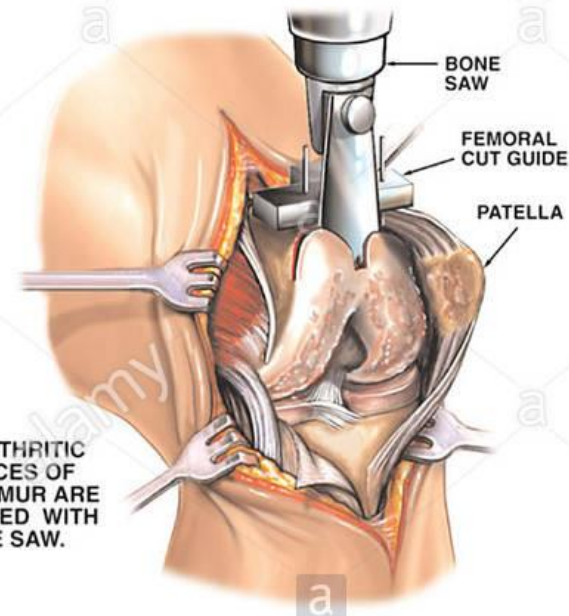
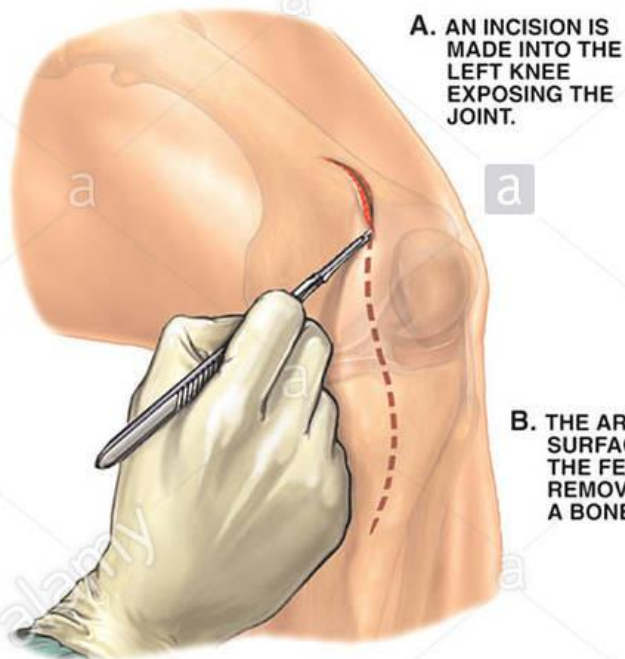
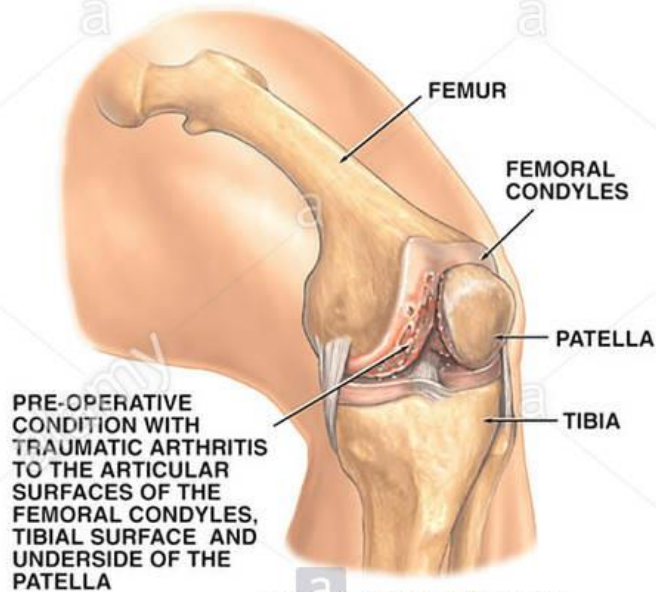


### SUCCESS RATE

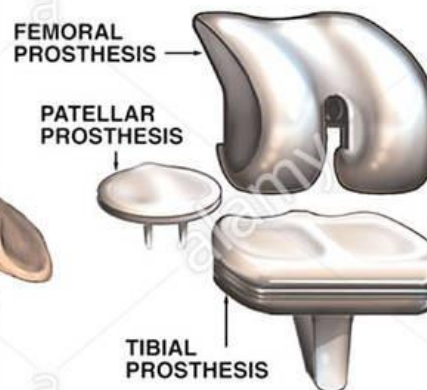


### COMPLICATION RATE

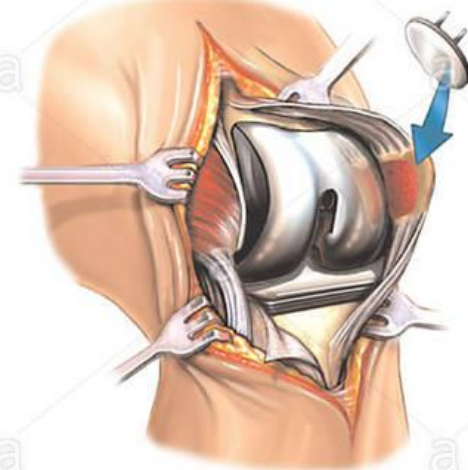




**D. THE FEMORAL AND TIBIAL PROSTHESES ARE PUT INTO PLACE.**



**E. A BUTTON IS PLACED OVER THE BACK OF THE PATELLA AND THE WOUND IS CLOSED**





# PROCESS OF TOTAL KNEE REPLACEMENT SURGERY

1



An **Incision** is made exposing the left knee joint.

2



**Exposure** of Arthritic Knee Joint. **Removal** of Menisci & cruciate ligaments.

3



**Resection** of Femur tibia patella with cutting guides.

4



**Placement** of Femoral & Tibial components.

5



**Placement** of patella component.

6



The **wounds** are closed & the skin stapled.



40%

Over **40%** of recent total knee replacements have been performed on men and women below the **age of 65**.

### By age *Number and percentage of discharges in 2010*

18-44 11,833 (1.8%)

45-64 275,666 (42.0%)

65-84 351,209 (53.5%)

85+ 17,315 (2.6%)

*0.1% were unreported or under the age of 17*

# 3.5 MILLION

Predicted annual demand  
for knee replacement  
surgeries by 2030

AMONG  
AMERICANS  
AGES

## 70-79...



### 8.2%

OF WOMEN

have had at least  
one knee replaced



### 7.1%

OF MEN

have had at least  
one knee replaced



### 1/3:

AMOUNT

of knee replacement  
surgery patients who  
are considered obese

# JOINT REPLACEMENTS By the Numbers

**719,000**

Total knee replacements

**120  
percent**

jump in knee replacements  
over a 10-year period

**50**

**million**

people suffer from  
arthritis

New knees can last for

**20 years**



**10 percent**  
of people will need  
revision surgery

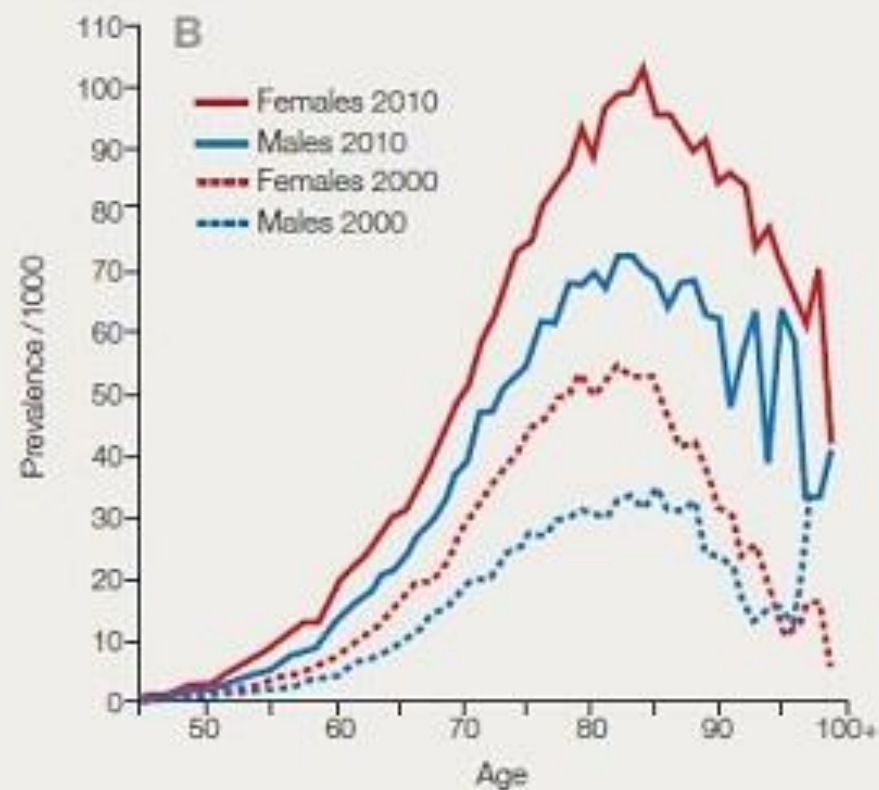
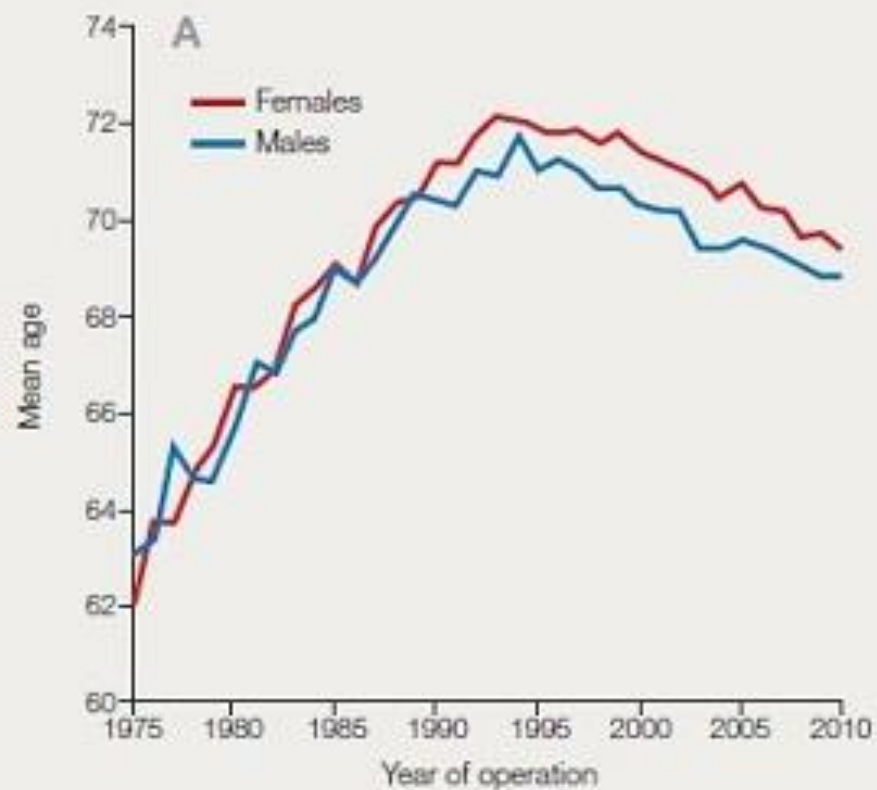
Total hip  
replacements

**332,000**

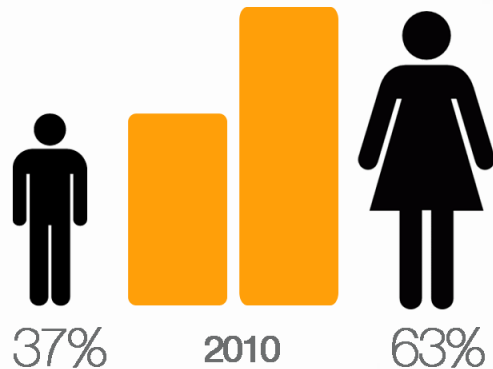
**\$35,000 - \$45,000**

cost of total hip replacement  
without insurance

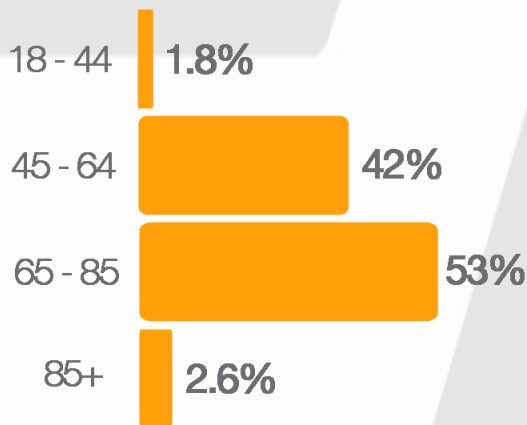




## by GENDER

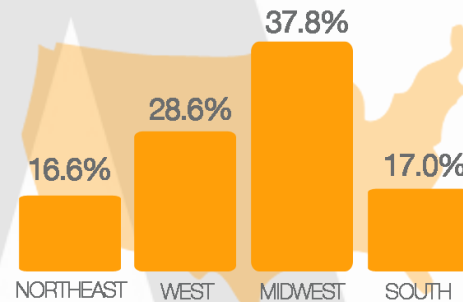


## by AGE



\* Statistics are based on data from the American Association of Hip and Knee Surgeons.

## BY REGION



## SUCCESS RATE



**9/10**  
PATIENTS EXPERIENCE  
DRAMATIC PAIN RELIEF.

## COMPLICATION RATE



**6.1%**  
DURING HOSPITAL STAY



**7.5%**  
90 DAYS AFTER SURGERY

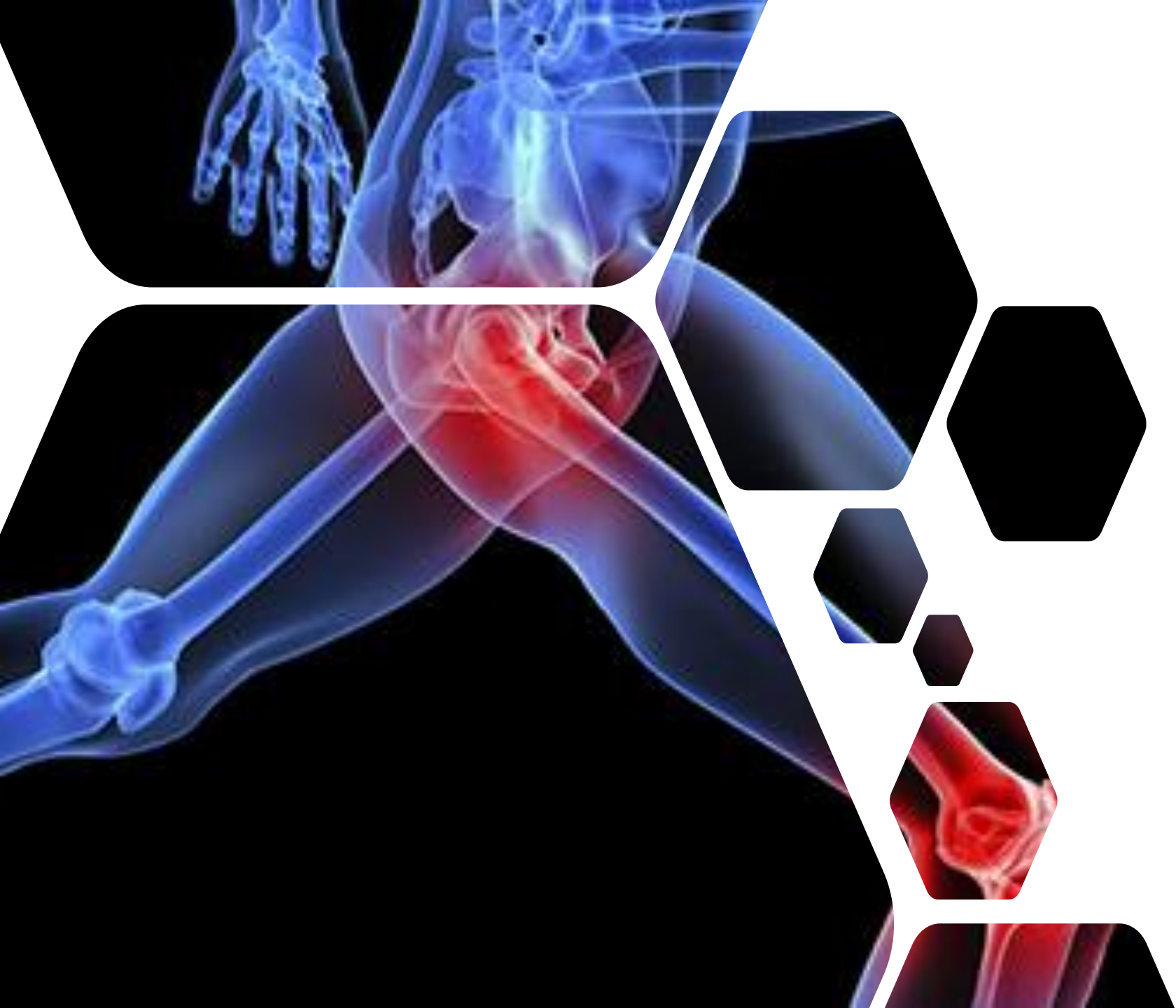
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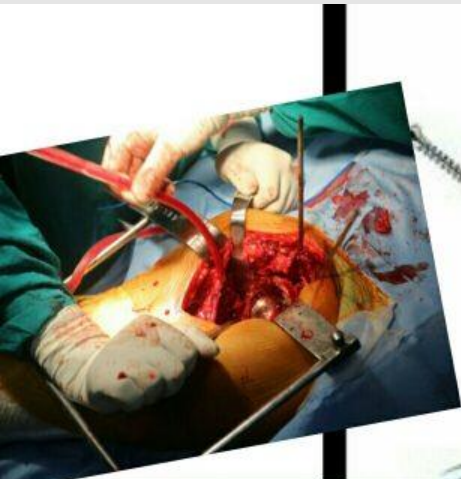
Before

After



|                           | <b>Partial Knee Replacement</b>                                    | <b>Total Knee Replacement</b>                                                                       |
|---------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Indications               | Osteoarthritis affecting one of the three compartments of the knee | Osteoarthritis affecting 2 or more compartments of the knee. Other forms of arthritis eg rheumatoid |
| Age group                 | Generally over 40 years                                            | Generally over 40 years                                                                             |
| Incision length           | 6 cm                                                               | 12-15 cm                                                                                            |
| Post op recovery          | Less pain and home within 2-3 days                                 | More painful and home generally within 5-7 days                                                     |
| Blood loss                | Less blood loss. Blood transfusion rate less than 1%               | Significantly more blood loss - Blood transfusion rate 25% (highly variable)                        |
| Back to work (office)     | 4-6 weeks                                                          | 6-12 weeks                                                                                          |
| Survivorship of implant   | 80%@ 20 years                                                      | 80-85% @20 years                                                                                    |
| Range of movement of knee | Almost full                                                        | rarely full range. Usually around 120 degrees                                                       |
| Function                  | Knee feels more natural, better stair climbing ability             | Most daily activities possible but knee feels                                                       |

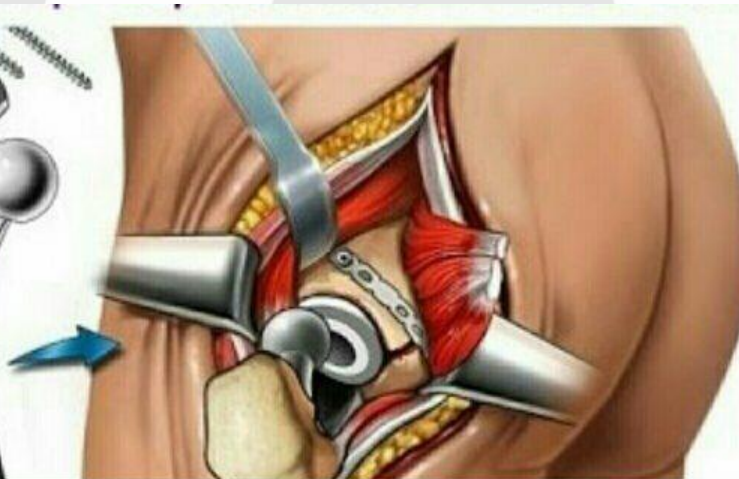




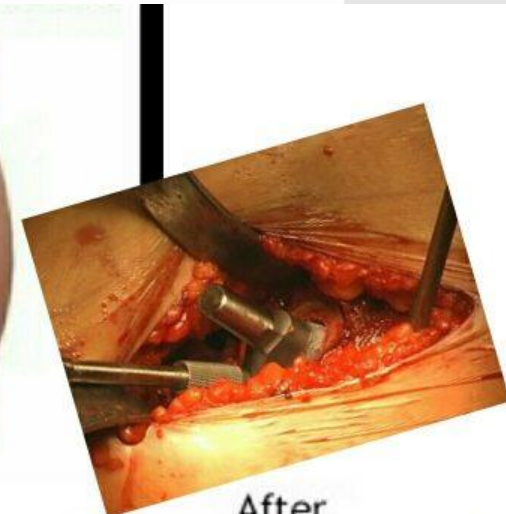
**A. Incision Site Over Right Hip**



**B. Exposure & Cutting of Femoral Neck, Removal of Femoral Head**



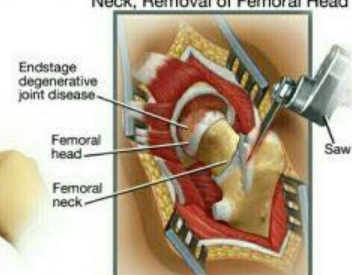
**C. Reaming of Acetabulum**



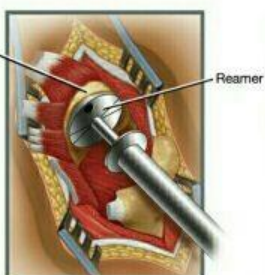
**After**



**D. Placement of Acetabular Cup and Screw**



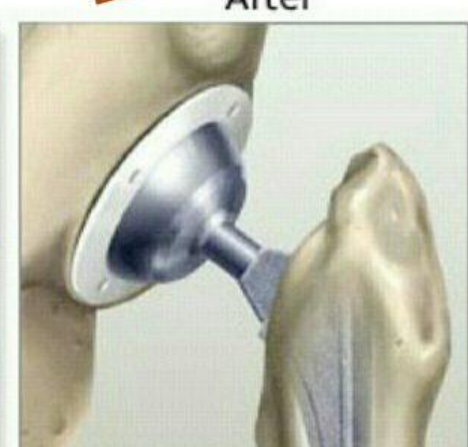
**E. Reaming of Femoral Canal, Placement of Femoral Prosthesis**



**F. Final View of Total Hip Prosthesis**



**Before**



# TOTAL HIP REPLACEMENT



## Traditional Surgery versus SuperPATH®:

|                         | Traditional Hip Replacement                                                                                                                                                                                                                      | Anterior Hip Replacement                                                                                                                                                                                                                                                                                                                                                       | SuperPATH® Replacement                                                                                                                                                                                                                                                                                                     |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Average Hospital Stay   | 4-5 days                                                                                                                                                                                                                                         | 1-3 days                                                                                                                                                                                                                                                                                                                                                                       | <b>24 hours</b>                                                                                                                                                                                                                                                                                                            |
| Average Recovery Period | 3 - 6 months                                                                                                                                                                                                                                     | 1 - 3 months                                                                                                                                                                                                                                                                                                                                                                   | <b>A few weeks</b>                                                                                                                                                                                                                                                                                                         |
| Average Incision Length | 10-12 inch incisions                                                                                                                                                                                                                             | 4 - 6 inches                                                                                                                                                                                                                                                                                                                                                                   | <b>2-3 inches</b>                                                                                                                                                                                                                                                                                                          |
| Surgical Summary        | <ul style="list-style-type: none"> <li>• Muscles &amp; tendons cut</li> <li>• Piriformis cut</li> <li>• Capsule cut or removed</li> <li>• Surgical hip dislocation required</li> <li>• Can use any implant</li> <li>• Drains optional</li> </ul> | <ul style="list-style-type: none"> <li>• No cuts to muscles or tendons</li> <li>• Piriformis cut in select cases</li> <li>• Capsule removed</li> <li>• Surgical hip dislocation typically used</li> <li>• Special table or apparatus required to "reverse jack-knife" hip joint for exposure</li> <li>• Implants limited due to exposure</li> <li>• Drains required</li> </ul> | <ul style="list-style-type: none"> <li>• No cuts to muscles or tendons</li> <li>• Piriformis cut in select cases</li> <li>• Capsule completely preserved</li> <li>• No surgical dislocation/relocation</li> <li>• No unnatural twisting during surgery</li> <li>• Can use any implant</li> <li>• No drains used</li> </ul> |
| Patient Mobility        | <ul style="list-style-type: none"> <li>• Limited movement (precautions) following surgery</li> <li>• Extensive rehabilitation required</li> </ul>                                                                                                | <ul style="list-style-type: none"> <li>• Minimal post-operative precautions</li> <li>• Shortened rehabilitation required</li> </ul>                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• Minimal post-operative precautions</li> <li>• Rehabilitation is walking only</li> </ul>                                                                                                                                                                                           |

### Table III: Complications<sup>1,3,6,10</sup>

Perforation of the posterior shaft of the femur

Nerve palsies – sciatic/ femoral nerve (7%)<sup>1</sup>

Failure of trochanteric fixation

Malpositioning of the acetabular component

Aseptic loosening of the femoral component

Dislocations (2%)<sup>1</sup>

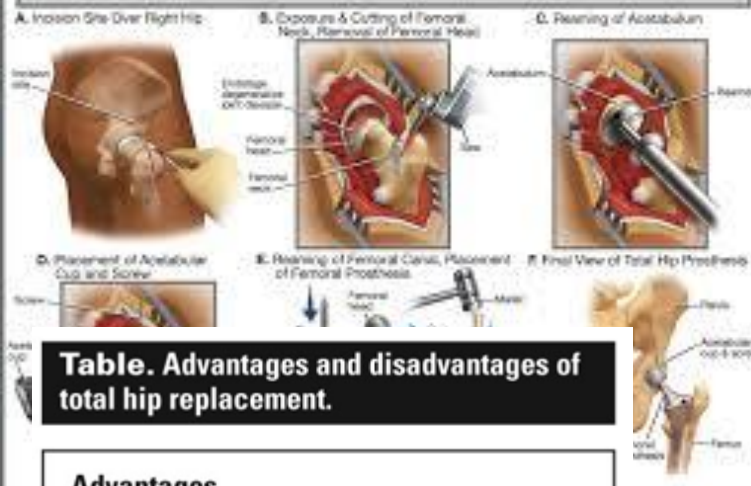
Heterotrophic ossification (13%, no NSAIDs given)<sup>1</sup>

Deep vein thrombosis/ pulmonary embolism<sup>6</sup>

Delayed wound healing

Infection

### RIGHT TOTAL HIP REPLACEMENT SURGERY



**Table. Advantages and disadvantages of total hip replacement.**

#### Advantages

- Predictable immediate pain relief and return to function.
- Predictable long-term implant survival.
- Low risks and few complications for healthy patients.
- Contemporary bearing surfaces that may reduce long-term wear.
- Multiple indications (osteoarthritis, inflammatory arthritis, osteonecrosis, posttraumatic hip conditions).
- Bone preservation options (hip resurfacing, tapered femoral stems).

#### Disadvantages

- Prosthetic joint replacement limitations.
- Activity limitations (nonimpact only).
- Bearing surface wear in younger active patients.
- Revision surgery complications (three to five times higher than for primary THR).
- Major complications (infrequent).

# JOINT REPLACEMENTS By the Numbers

**719,000**

Total knee replacements

**120  
percent**

jump in knee replacements  
over a 10-year period

**50**

**million**

people suffer from  
arthritis

New knees can last for

**20 years**



**10 percent**  
of people will need  
revision surgery

Total hip  
replacements

**332,000**

**\$35,000 - \$45,000**

cost of total hip replacement  
without insurance



## 2005 Guidelines

| Allowed            |     | Allowed with Experience |     | No Consensus       |     | Not Recommended |     |
|--------------------|-----|-------------------------|-----|--------------------|-----|-----------------|-----|
| THA TKA            |     | THA TKA                 |     | THA TKA            |     | THA TKA         |     |
| Bowling            | ✓ ✓ |                         |     | Volleyball         | ✓   |                 |     |
| Stationary cycling | ✓ ✓ |                         |     | Fencing            | ✓ ✓ | Basketball      | ✓ ✓ |
| Ballroom dancing   | ✓ ✓ | Roller skating          | ✓   | Roller skating     | ✓   | Football        | ✓ ✓ |
| Golf               | ✓ ✓ | Rowing                  | ✓ ✓ | Downhill skiing    |     |                 |     |
| Horseback riding   |     | Ice skating             | ✓ ✓ | Weight lifting     | ✓ ✓ |                 |     |
| Shuffleboard       | ✓ ✓ | Cross-country skiing    | ✓ ✓ | Baseball           | ✓ ✓ |                 |     |
| Swimming           | ✓ ✓ | Stationary skiing       | ✓ ✓ | Gymnastics         | ✓ ✓ | Jogging         | ✓ ✓ |
| Normal walking     | ✓ ✓ | Doubles tennis          | ✓ ✓ | Handball           | ✓ ✓ |                 |     |
| Canoeing           | ✓ ✓ | Speed walking           |     | Hockey             | ✓ ✓ | Soccer          | ✓ ✓ |
| Road cycling       | ✓ ✓ | Weight Machine          |     | Rock climbing      | ✓ ✓ |                 |     |
| Square dancing     | ✓ ✓ | Horseback riding        | ✓ ✓ | Squash/racquetball | ✓ ✓ |                 |     |
| Hiking             | ✓ ✓ | Downhill skiing         | ✓ ✓ | Singles tennis     | ✓ ✓ | Volleyball      | ✓   |
| Speed walking      | ✓ ✓ | Weight lifting          | ✓   | Weight machine     | ✓ ✓ |                 |     |

# Dos and Don'ts To Protect Your New Hip

- Don't cross your legs at the knees for at least 6 to 8 weeks.
- Don't bring your knee up higher than your hip.
- Don't lean forward while sitting or as you sit down.
- Don't try to pick up something on the floor while you are sitting.
- Don't turn your feet excessively inward or outward when you bend down.
- Don't reach down to pull up blankets when lying in bed.
- Don't bend at the waist beyond 90 degrees.

• From the American Academy of Orthopaedic Surgeons

## *The Dos*

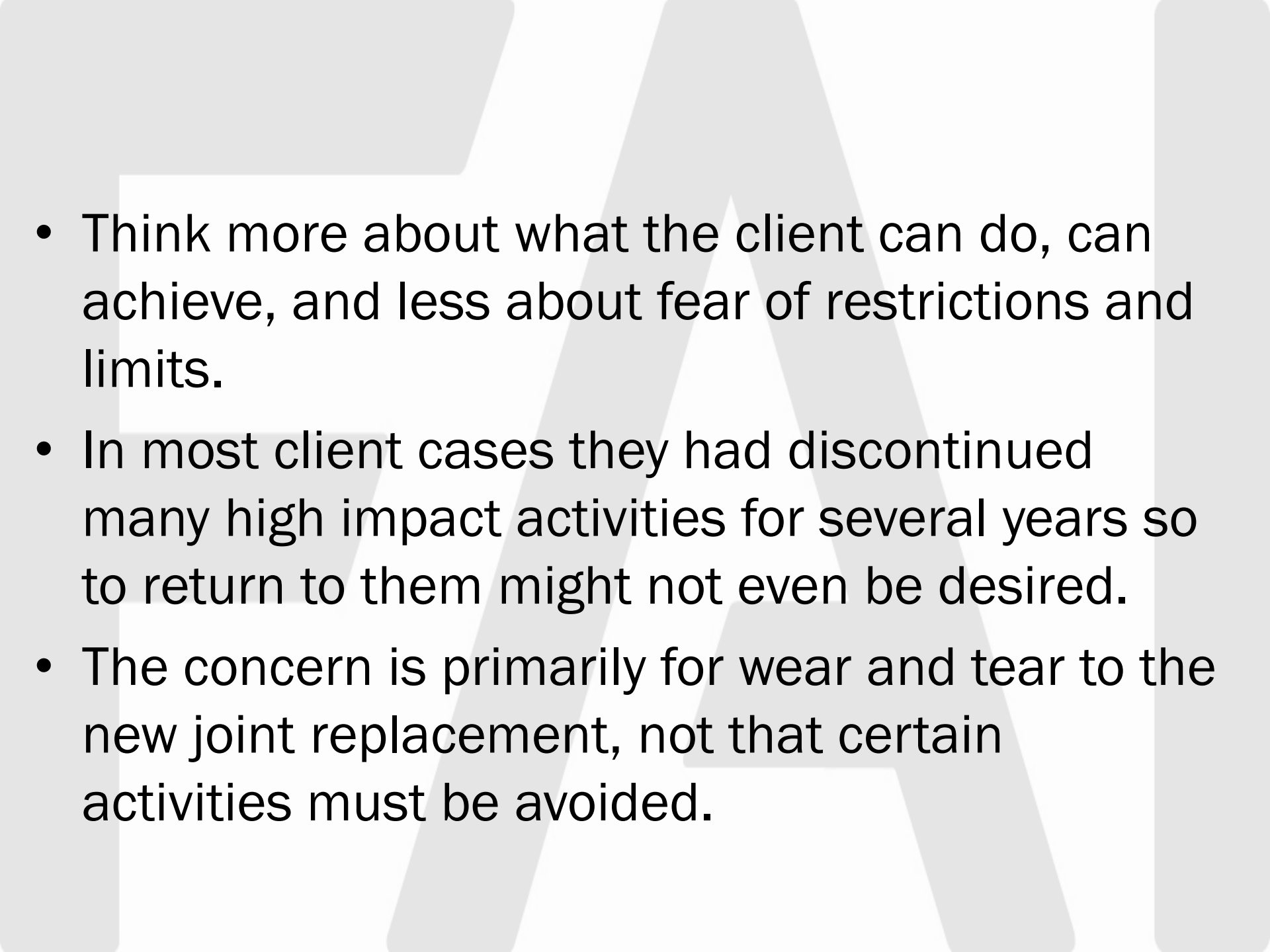
- Do keep the leg facing forward.
  - Do keep the affected leg in front as you sit or stand.
  - Do use a high kitchen or barstool in the kitchen.
  - Do kneel on the knee on the operated leg (the bad side).
  - Do use ice to reduce pain and swelling, but remember that ice will diminish sensation. Don't apply ice directly to the skin; use an ice pack or wrap it in a damp towel.
- 
- Do apply heat before exercising to assist with range of motion. Use a heating pad or hot, damp towel for 15 to 20 minutes.
- 
- Do cut back on your exercises if your muscles begin to ache, but don't stop doing them!

## Total Knee and returning to sports and activities

As soon as your doctor gives you the go-ahead, you can return to many of the sports activities you enjoyed before your knee replacement.

- Walk as much as you would like, but remember that walking is no substitute for the exercises prescribed by your doctor and physical therapist.
- Swimming is an excellent low-impact activity after a total knee replacement; you can begin as soon as the sutures have been removed and the wound is healed.
- In general, lower impact fitness activities such as golfing, bicycling, and light tennis will help increase the longevity of your knee and are preferable over high-impact activities such as jogging, racquetball and skiing.

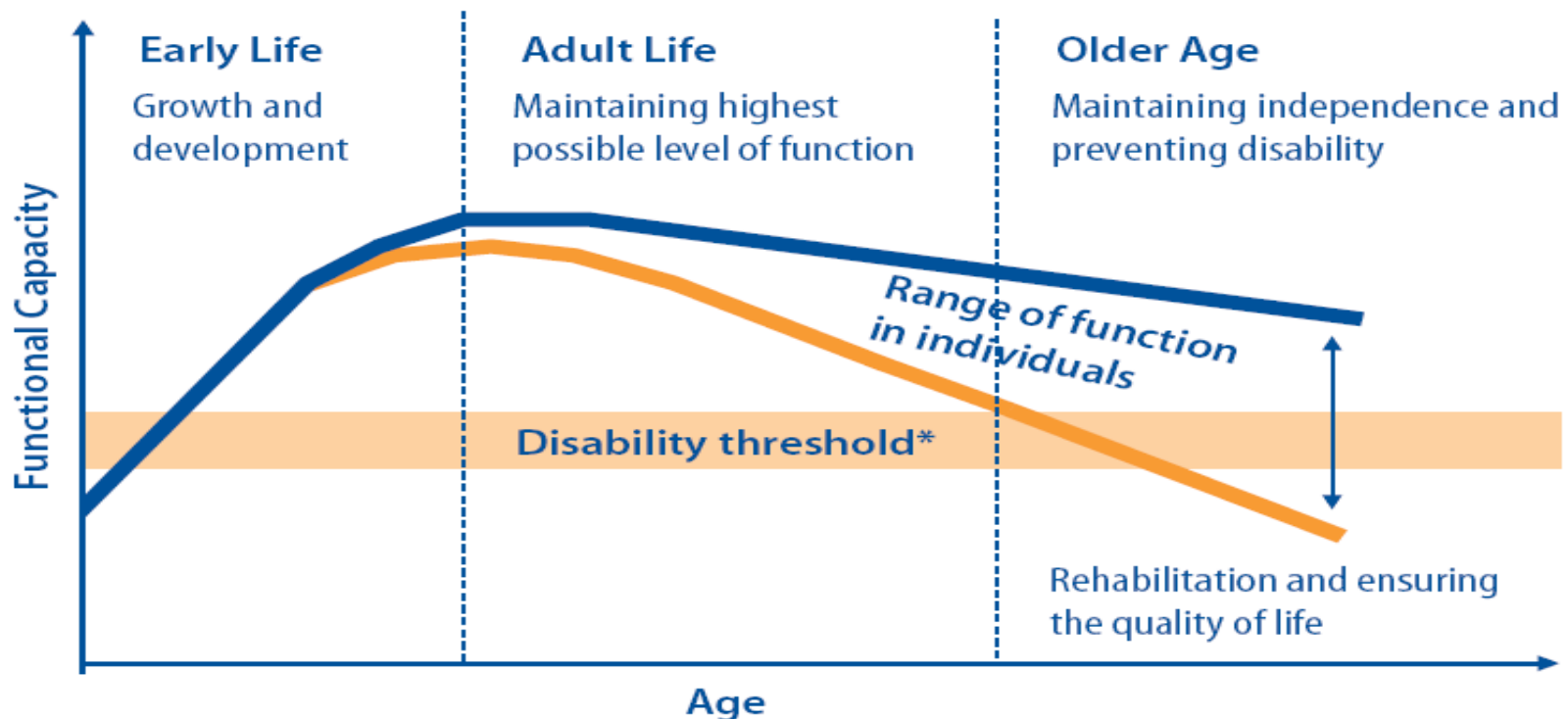
•From the American Academy of Orthopaedic Surgeons

- 
- Think more about what the client can do, can achieve, and less about fear of restrictions and limits.
  - In most client cases they had discontinued many high impact activities for several years so to return to them might not even be desired.
  - The concern is primarily for wear and tear to the new joint replacement, not that certain activities must be avoided.



# Huge variability in impairments means huge variability in functional abilities

**Figure 4. Maintaining functional capacity over the life course**



Source: Kalache and Kickbusch, 1997

# Hierarchy of Physical Function



The logo consists of the letters 'FAI' in a bold, white, sans-serif font, centered within a red shield-shaped background.

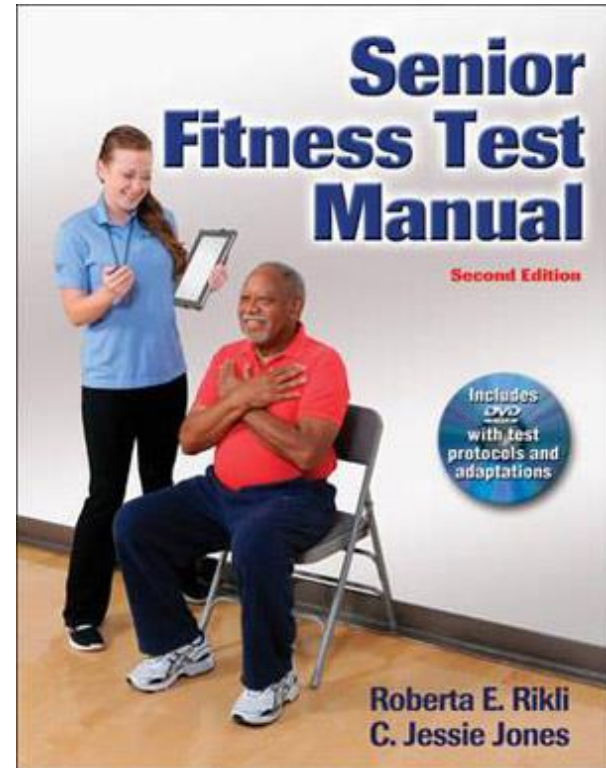
**FAI**

The background of the slide is a dark, grayscale photograph of a group of people, mostly older adults, riding bicycles. They are smiling and appear to be in a group setting, possibly a community ride or a fitness class. The image is semi-transparent, allowing the text to be clearly visible.

# Functional Fitness Assessments

# Senior Fitness Test Battery

- Chair Stand
- Arm Curl
- 8' Up and Go
- 2-min Step in Place
  - Or 6 min Walk
- Chair Sit and Reach
- Back Scratch



# Chair Stand

- Assesses lower-extremity strength under practical (functional) conditions
- Validated against 1RM leg press
- Number of times a person can rise from a chair in 30 seconds

# Chair Stand Norms

|        | Women |       |       |       | Men   |       |       |       |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| % Rank | 60-64 | 65-69 | 70-74 | 75-79 | 60-64 | 65-69 | 70-74 | 75-79 |
| 90     | 20    | 18    | 18    | 17    | 22    | 21    | 20    | 20    |
| 80     | 18    | 16    | 16    | 16    | 20    | 19    | 18    | 18    |
| 70     | 17    | 15    | 15    | 14    | 19    | 18    | 17    | 16    |
| 60     | 16    | 14    | 14    | 13    | 17    | 16    | 16    | 15    |
| 50     | 15    | 14    | 13    | 12    | 16    | 15    | 14    | 14    |
| 40     | 14    | 13    | 12    | 12    | 15    | 14    | 13    | 13    |
| 30     | 12    | 12    | 11    | 11    | 14    | 13    | 12    | 12    |
| 20     | 11    | 11    | 10    | 9     | 13    | 11    | 11    | 10    |
| 10     | 9     | 9     | 8     | 8     | 11    | 9     | 9     | 8     |

# 8' Up and Go

- Assesses agility/dynamic balance
- How long it takes a person to rise from a chair, walk around a cone 8' away and return to their seat
- Older adults who required greater than 8.5 seconds to complete the UG were classified as fallers.
- Overall prediction rate of classification was 82%.



# 8' Up and Go Norms

|        | Women |       |       |       | Men   |       |       |       |  |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| % Rank | 60-64 | 65-69 | 70-74 | 75-79 | 60-64 | 65-69 | 70-74 | 75-79 |  |
| 90     | 3.7   | 4.1   | 4.0   | 4.3   | 3.0   | 3.6   | 3.6   | 3.5   |  |
| 80     | 4.2   | 4.6   | 4.7   | 5.0   | 3.6   | 4.1   | 4.2   | 4.3   |  |
| 70     | 4.6   | 5.0   | 5.2   | 5.5   | 4.0   | 4.5   | 4.6   | 4.9   |  |
| 60     | 4.9   | 5.3   | 5.6   | 5.9   | 4.4   | 4.8   | 5.0   | 5.4   |  |
| 50     | 5.2   | 5.6   | 6.0   | 6.3   | 4.7   | 5.1   | 5.3   | 5.9   |  |
| 40     | 5.5   | 5.9   | 6.4   | 6.7   | 5.0   | 5.4   | 5.6   | 6.4   |  |
| 30     | 5.8   | 6.2   | 6.8   | 7.1   | 5.4   | 5.7   | 6.0   | 6.9   |  |
| 20     | 6.2   | 6.6   | 7.3   | 7.6   | 5.8   | 6.1   | 6.4   | 7.5   |  |
| 10     | 6.7   | 7.1   | 8.0   | 8.3   | 6.4   | 6.6   | 7.0   | 8.3   |  |