2007 Orthopaedic Reconstruction strategy

To be the brand preferred by active, informed patients for knees and hips
What does our strategy mean for products?

**Retain**
Helps patients retain an active lifestyle, with no restrictions on post-procedure activities
(SUPARTZ® Joint Fluid Therapy)

**Replace**
Replaces patient joints with artificial devices
(SYNERGY® hip, PROFIX® knee, GENESIS® II knee)

**Restore**
Restores normal function with advanced implants & surgical techniques
(COMPETITOR™ knee, JOURNEY™ knee, BHR™ system)

**Rebuild**
Rebuilds the body to recover from implant failure
(LEGION® revision knee, EMPERION® hip)
Knee product portfolio

**Restore**
- COMPETITOR™ Uni
- COMPETITOR DEUCE™

**Replace**
- JOURNEY™ GENESIS™ II, PROFIX™

**Rebuild**
- LEGION™

64 and under procedures are 39% of US Market
22% Growth

JOURNEY™

64 and under procedures are 40% of US Market
21% Growth

Active Patient

Active Revision

Active Technologies

Source: Solucient, 2005

We have a firm foundation in knee replacement

GENESIS™ II and PROFIX™ knees with over ten years of clinical and commercial success.

Introduced OXINIUM™ Oxidized Zirconium as the first advanced bearing for knees

Using technology and innovation to change the face of knee replacement

GENESIS™ II Total Knee System

Proven clinical track record

- **Laskin 5 year results** – 100 patients with mean flexion at 118°. Lateral retinacular release in only 3 patients, Excellent flexion space, Kaplan Meir Survivorship 98% at 5 years, (The Knee, 2004 pp 164-167)

- **Bourne GENESIS II results** –, 6-11 year follow-up with 98% survivorship at 9 years, (presented at Interim Knee Society meeting 2006)

- **Haas MIS results** – 40 consecutive MIS procedures, average ROM at one year was 125° compared to 116° in control group, high Knee Society scores (CORR, #428 pp 68-73)

PROFIX™ Total Knee System

Over 10 years of success:
Surgeon Designer – Leo A. Whiteside
Over 150,000 cases since 1995 launch

Growth Markets (2006)
- Italy, Netherlands, UK, Denmark, Finland, Portugal, Sweden, Puerto Rico, and Norway

Clinical Results:
Long term cementless results equal those of cemented systems.
Bellemans’ 10 yr cementless results exceed 97% survivorship.
Whiteside’s 12 yr cementless results equal 99% survivorship.
Norwegian Registry: Highest Survivorship
Knee product highlights for 2007

LEGIION°
Revision Knee

JOURNEY°
Bi-Cruciate Stabilized Knee
LEGION° Revision Knee System

Comprehensive
More means to replicate the anatomy than any other revision system
A custom-like implant fit to each patient due to superior offset capabilities

Efficient
New instrumentation designed specifically for revisions
Rod mounted cutting blocks diminishes reliance on pins for faster, more accurate cuts
Enhanced visibility and ease of use
Potential reduction in procedure time

Built to Last
Advanced OXINIUM° bearing surface provides wear resistance without brittleness
Superior wear performance of OXINIUM Oxidized Zirconium in abraded conditions which are typical to revisions
Potentially longer wear decreases chance of second revision

LEGION™ Revision Knee System

Implants

Based on implants with over 10 years of clinical success

Infinite options

• 360 degrees of femoral and tibial offset in 2, 4 and 6mm couplers

• 56 tibial wedges (block, hemi-stepped, hemi-angled, full angled)

• 68 femoral wedges (distal, posterior, L-wedges)

• 72 stems (cemented, press-fit, straight, bowed)

LEGION® Revision Knee System

**Instruments**

More steps, fewer parts

Multiple techniques allow for surgeon preference

Dial-in femoral and tibial offset

Once-on femoral trial (ream for box, cam module, trial)

Ability to cut through the femoral trial

LEGION™ Revision Knee product demo
JOURNEY™
Bi-Cruciate Stabilized Knee System

Designed by nature.
Shaped by technology.
Why design JOURNEY™?

Patients remain unsatisfied with the function of total knee replacements:

- “...improvements in knee function still are needed to allow patients to do all activities that they consider important.” ¹
- “Patients who had total knee replacements still experienced substantial functional impairment ... This suggests that significant improvements in the procedure and prosthetic designs are needed to restore normal knee function after a total knee arthroplasty.” ²

¹ Weiss et. al. “What functional activities are important to patients with knee replacements?” CORR. (404): 172-88. 2002
The JOURNEY™ Knee System

ACL Function

• Anterior Cam and Post Mechanism

Increased stability

• More natural shapes and contours
• More normal motion
• Reduced paradoxical motion

Increased flexion

• Restored posterior offset
• Extended posterior condyles

*Trademark of Smith & Nephew.
Sizing

10 femoral sizes for better fit and minimal bone resections

- JOURNEY™ system is designed to achieve the best fit for all patients while delivering natural motion.

- Range of smaller sizing choices are more amenable to female anatomy, larger sizes fit for males.
JOURNEY° Knee development story

Brian McKinnon
Maximizing the performance envelope

**Function**
- Stability
- Kinematics
- Flexion
- Fit

**Durability**
- Minimize wear
- Maximize strength

**Robustness**
- Accepts variability with minimum sacrifice
Kinematics – normal knee

Doing our homework – study of current products

- Implant Shapes
- Stability
- Kinematics
- Flexion
- Clinical History
Kinematics – conventional TKR
New technology

State of the art methods for a state of the art knee
Design technology evolution

Anatomic databases
- Femur/tibia 3-d computer models from CT/MRI Scans
- Provides specific information needed to properly size implant components

Parametric CAD modeling
- Precise control of implant form
- Implant shapes can be easily modified by changing geometric “parameters”

Computer simulations
- Virtual lower-leg simulator
- Allows design optimization through iteration/statistical methods

History
- Clinical history on existing TKR designs gives important insight into what works and doesn’t work.
Doing our homework – studying the normal knee

- Bone shapes
- Stability
- Kinematics
- Flexion
Parametric implant CAD modeling

- Femoral/Tibial geometry controlled with over 80 parameters
- Allows precise control of geometry
LifeMOD/KneeSIM

- Dynamic simulation of an Oxford Rig
- Physics engine used to determine kinematics and kinetics
- Muscles, soft tissues, implant contact, friction modeled
- Deep knee bend and gait activities
- Smith & Nephew Proprietary code added to enhance analysis
LifeMOD/KneeSIM simulation output
Dynamic stress analysis model
Design process

• Design process
  – Design (parametric CAD)
  – Simulate in LifeMOD/KneeSIM
  – Interpret results
  – Iterate (JOURNEY™ 55th iteration)

• Virtual testing followed up with physical testing, cadaver labs, and clinical evaluation

*Trademark of Smith & Nephew.
JOURNEY\® Knee – the optimized solution

\*Trademark of Smith & Nephew.
Durability - wear

• Tested to 20 million cycles
• JOURNEY™ Knee had less wear than a conventional PS TKA

*Trademark of Smith & Nephew.
Summary

Function

- Shapes
- A/P Stability
- Kinematics
- Flexion

Durability

- 20 million cycles – less wear than conventional knee design

Robustness

- Sensitivity study shows polyethylene insert stresses within 10% of the optimal alignment
An eye toward the future...

Smith & Nephew knee design will build on our demonstrated history of innovation with continued focus on high performance biomechanics and function.

Biomechanically correct revision components to expand the versatility of the LEGION° Revision Knee

Continued development of ligament retaining versions of the JOURNEY° Knee

Resurfacing knee design

Continued development of selective replacement

We are smith&nephew