

The Future of Endoprosthetics



Noord West Hospital group
Center for Orthopedic research

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No disclosures



Agenda

- Noordwest hospital group and focus clinics
- 2019 The use of the EHR in The Netherlands
- Orthopedic Care & COVID 19 in the Netherlands
- Back to the future: Monitor orthopaedic care (implant registry)
- Orthopaedic osteo-arthritis network and test centre for Quality
- Use of Wearables for indication and follow-up of arthroplasty
- New Implants TKA; Robotica in THA and TKA
- Patient Specific Instrumentation TSA and TAA
- Virtual Reality



Where I come from

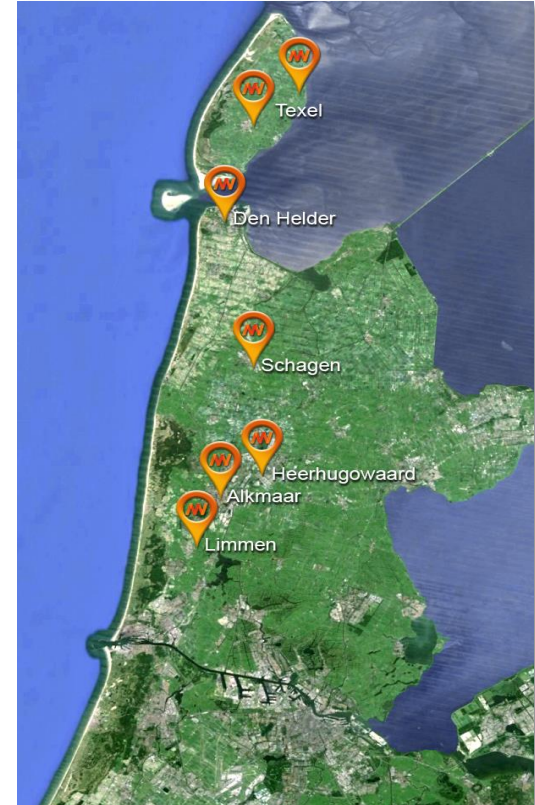
Noordwest hospitalgroup

Noordwest catchment area

- 400.000 inhabitants for basic cure
- 600.000 inhabitants for complex cure

Locations

- 2 hospitals with 850 beds
- 2 elective orthopedic focus clinics
- 5 regional outpatient clinics



What who revenue

Noordwest hospitalgroup

Hospital characteristics

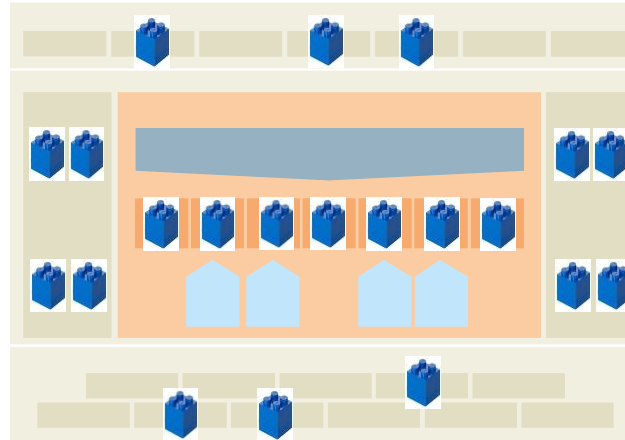
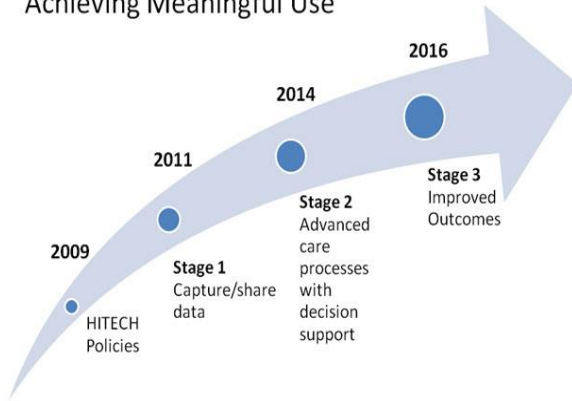
- 850 beds
- 90.000 hospitalizations
- 5.600.000 outpatient clinic visits
- 4.500 employees
- 280 doctors
- 16 orthopedic surgeons
- 2 orthopaedic fellows
- 10 residents
- €450.000.000 revenue



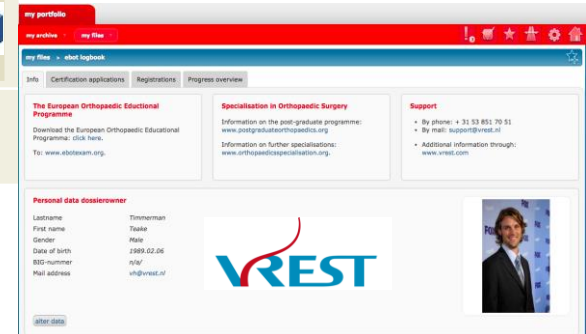
Erfarungen mit der Electronische Patientenakte Endoprothetic symposium 13 September 2019

Electronic Health Record (EHR)

Achieving Meaningful Use

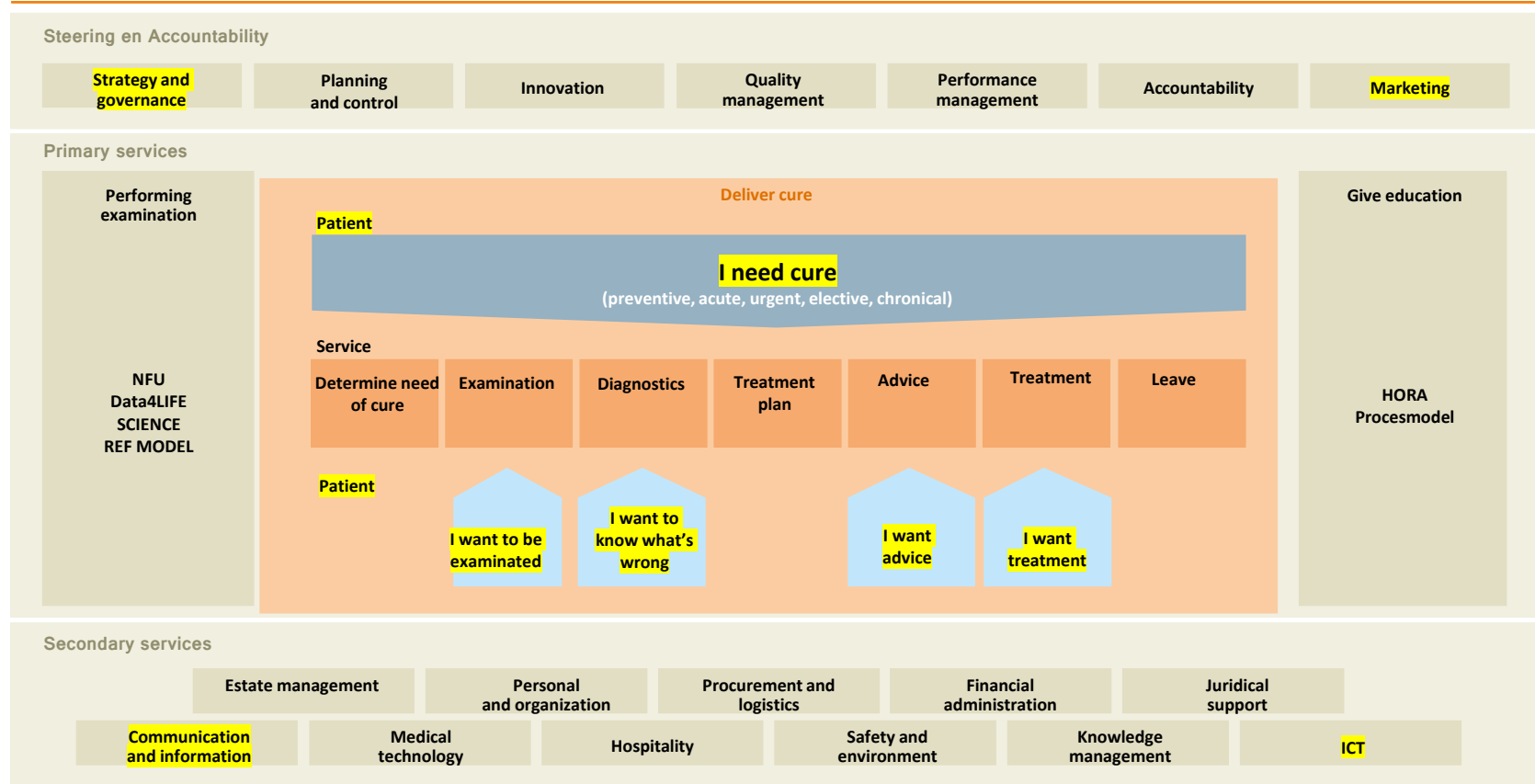


Resident Logbook (DPF)



I explained EHR model The Netherlands (source: Nictiz)

Servicemodel for dutch hospitals supported Ned institute for ICT in healthcare



In Orthopedic Care & COVID 19 in NL

The total number of **operations** that have been **postponed** **due to corona pressure** in hospitals and that still have to be made up is **about 190 thousand**.

Dutch Healthcare Authority (NZa)

After corona, we have to perform a total of 11 to 14 percent more operations than usual; **5100 TKA and 6450 THA**

(NZa) (LROI)

We take them Back to the future

Monitor orthopaedic care: implant registry

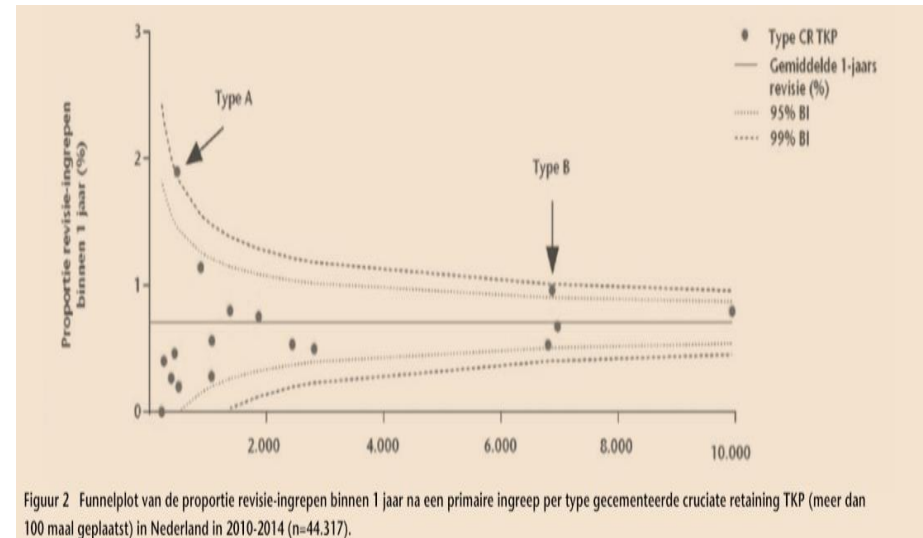


We know what we have to achieve because we have a

1. monitoring system: implant register, classify
2. monitor orthopaedic care: analyse outliers, audit hospitals

NOV 1A	10 jaars results	01-01-2016	
Gecementeerde cups		Gecementeerde stems	
Merk	Model	Merk	Model
Corin	Cenator	BBraun	BiContact Cemented
DePuy	Charnley and Elite Plus Flanged	Corin	TaperFit
DePuy	Charnley and Elite Plus LPW	DePuy	Charnley LF monobloc
DePuy	Charnley/Elite Plus Ogee	DePuy	Charnley modular
JRI	Muller type	DePuy	C-stem
Link	Interplanta	DePuy	C-stem AMT
Mathys	CCB Low Profile	DePuy	Furlong modular
Smith & Nephew	All Poly Reflection	JRI	SP II
Stryker	Exeter / Exeter Duration	Link	CCA Muller straight stem
Stryker	Contemporary	Mathys	Spectron EF
ZimmerBiomet	Apollo	Smith & Nephew	Exeter
ZimmerBiomet	CMK	Stryker	Omnifit cemented
ZimmerBiomet	Müller	Stryker	Bimetric (Ti) cemented
ZimmerBiomet	Müller Low Profile	ZimmerBiomet	CMK Modular
ZimmerBiomet	SHP	ZimmerBiomet	CPT
ZimmerBiomet	Stanmore	ZimmerBiomet	ME Müller straight stem
ZimmerBiomet	ZCA	ZimmerBiomet	MS 30
		ZimmerBiomet	Olympia
		ZimmerBiomet	Stanmore

NOV 1A	10 jaars results	01-01-2016	
Cementloze		Cementloze stems	



Figuur 2 Funnelplot van de proportie revisie-ingrepen binnen 1 jaar na een primaire ingreep per type gecementeerde cruciate retaining TKP (meer dan 100 maal geplaatst) in Nederland in 2010-2014 (n=44.317).

lroi.nl (<http://www.lroi-rapportage.nl/>)



- 100% of the hospitals in the Netherlands participate
- Completeness: 99% hip, 99% knee, 94% shoulder, 92% ankle and 88% elbow

LROI ACTUEEL OVER DE LROI INVOERDERS PATIËNTEN PUBLICATIES WETENSCHAP DOWNLOADS

De LROI is een register voor gewrichtsprothesen (heup, knie, enkel, schouder, elleboog, pols, vinger en duim) die in Nederland geplaatst zijn.

[Inloggen?](#)

Aantal registraties op dit moment

Totaal 671.487	Heup 369.692	Knie 286.602	Enkel 665
Schouder 13.239	Elleboog 846	Pols 138	Vinger/duim 305

to reduce the burden of waiting lists, the osteoarthritis network was established

Network Osteoarthritis

physiotherapy practices and general practitioners have **joined forces** with the orthopedic surgeons of the Northwest Hospital Group **to jointly optimize the treatment of knee and hip osteoarthritis.**

Stepped Care

Stepped care is a systematic and step-by-step approach to osteoarthritis that consists of 3 steps: **first step** is on information and exercise at home. **second step** you practice under the supervision of a physiotherapist. **step 3** operative treatment discussed with the orthopedic surgeon.

With help of our Test Center for Quality we can

Collect Prospective data

Monitoring to improve quality
Better screening
Prepare patient
Detecting an abnormal course
Detect outliers



Leads to
Satisfied patients

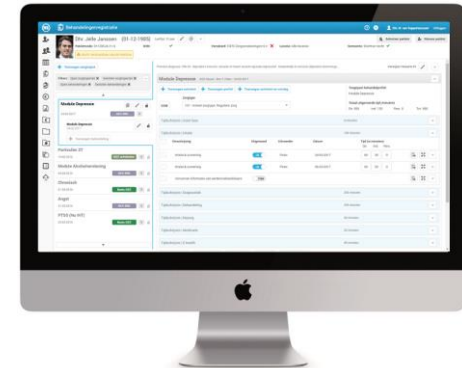
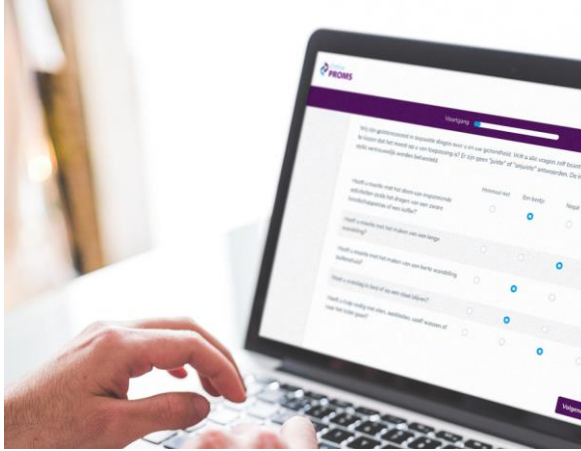


Prevents for
(Unnecessary)
healthcare costs

Not only data collection but also linking

Patients Performance

Patient satisfaction



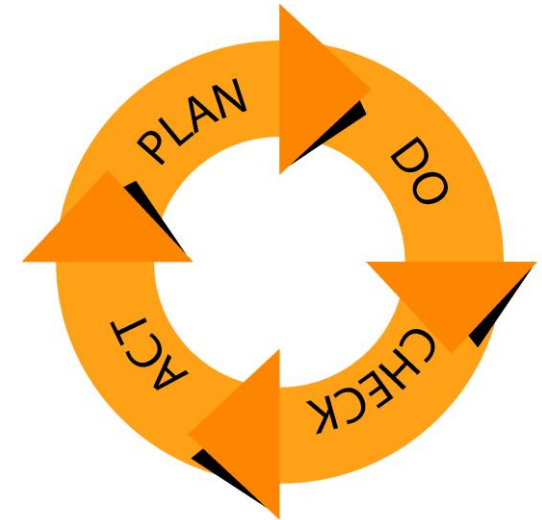
Patients Characteristics

Test Center for Quality gives us

Insight in

- Outcome of the operation
- Quality of the prosthesis used
- Quality of the doctor and hospital
- Patient experience on the long run
- Effect of (controllable) factors on outcome

a PDCA cycle
To improve in the future



We use innovative technology

Wearable move monitor

That Enables

Collaborate with 1st line

Reducing unnecessary influx of 2nd line

Insight into conservative trajectory

Quality-driven orthopedics



Patient Journey App



Example TKA problem

30.000 knee joint replacements in NL each year

☹ 20% patient dissatisfaction or residual pain/impairments

€€€ 35% > 2 hospital visits or > 12 weeks rehabilitation

Solution:

Remote & objective measurement of daily-life physical behaviour

Visualization of functional recovery and clinical endpoints

Tailored treatment: identification of delayed or accelerated recovery

quality
satisfaction



visits
burden



we use intra operative tools

Robotica in TKA (and THA)

Figure 19. Cutting robotic systems used in orthopaedics^{92,93}

System*	Application†	Cutting type	Cutting control
TSolution One	TKA	Direct	Autonomous
Mako	UKA	Direct	Haptic
Mako	TKA	Direct	Haptic
Mako MAKO	THA	Direct	Haptic
NAVIO CORI	UKA	Direct	Boundary control
NAVIO	TKA	Indirect	Boundary control
ROSA	TKA	Indirect	Cutting guide
OMNIBotics	TKA	Indirect	Cutting guide
SpineAssist	Pedicle screw	Indirect	Cutting guide
Globus	Pedicle screw		Cutting guide

*TSolution One is manufactured by Think Surgical; Mako, by Stryker; NAVIO, by Smith & Nephew; ROSA, by Zimmer Biomet; OMNIBotics, by OMNI; SpineAssist, by MAZOR Robotics; and Globus, by Excelsius Medical. †THA = total hip arthroplasty, TKA = total knee arthroplasty, and UKA = unicondylar knee arthroplasty^{92,93}

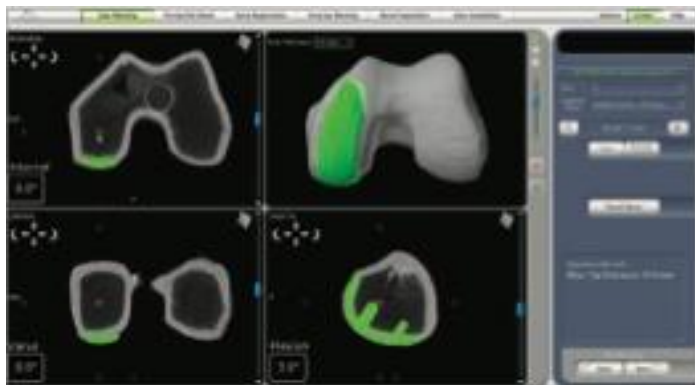


Mako SmartRobotics combines three key components

3D CT-based planning
AccuStop™ haptic technology
insightful data analytics

* into one platform which has shown better outcomes for total hip, total knee and partial knee patients.^{1,2,3}

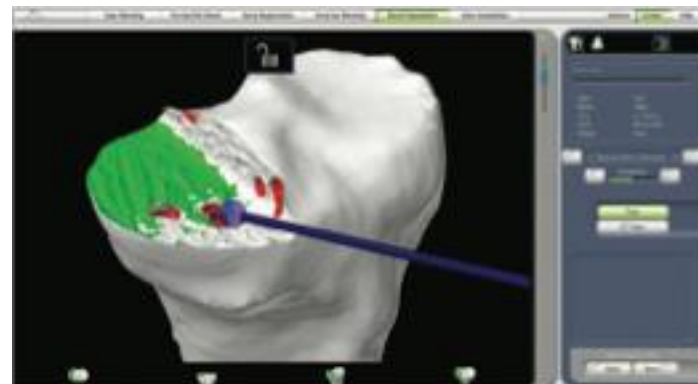
Know more



As a result we



Cut less



CORI SURGICAL SYSTEM also combines three components

Image free

Real time

Optimized alignment



CORI[®]
Surgical System



Real-time planning and gap assessment

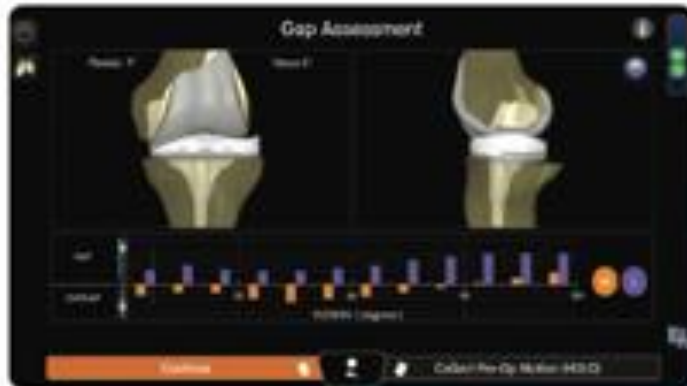


[Click to see the software video](#)

Image-free smart mapping



[Click to see the software video](#)



[Click to see the software video](#)

we also use

Patient Specific Instrumentation

In TAA and TSA

TAA

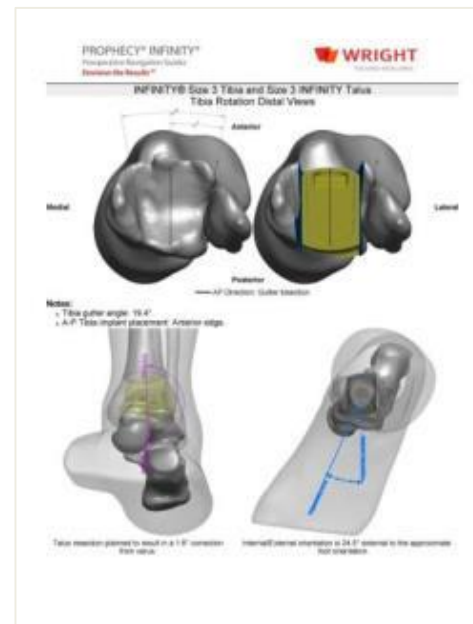
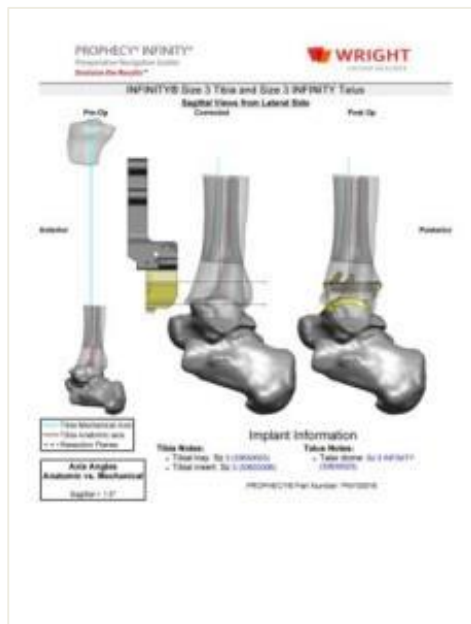
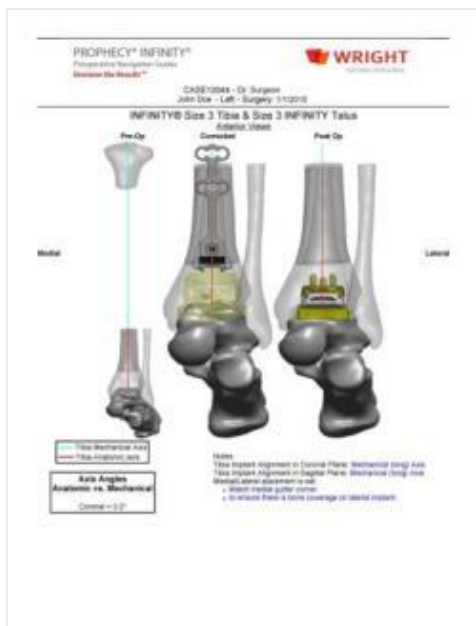


PROPHECY[®] INFINITY[®] Preoperative Navigation System

Technique Overview

Pre-Operative Steps

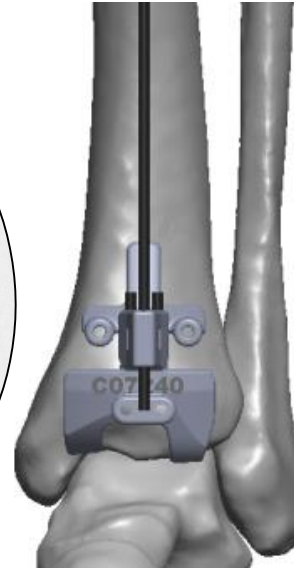
Pre-Operative plan based on anatomic landmarks
and surgeon preferences



Prophecy Alignment

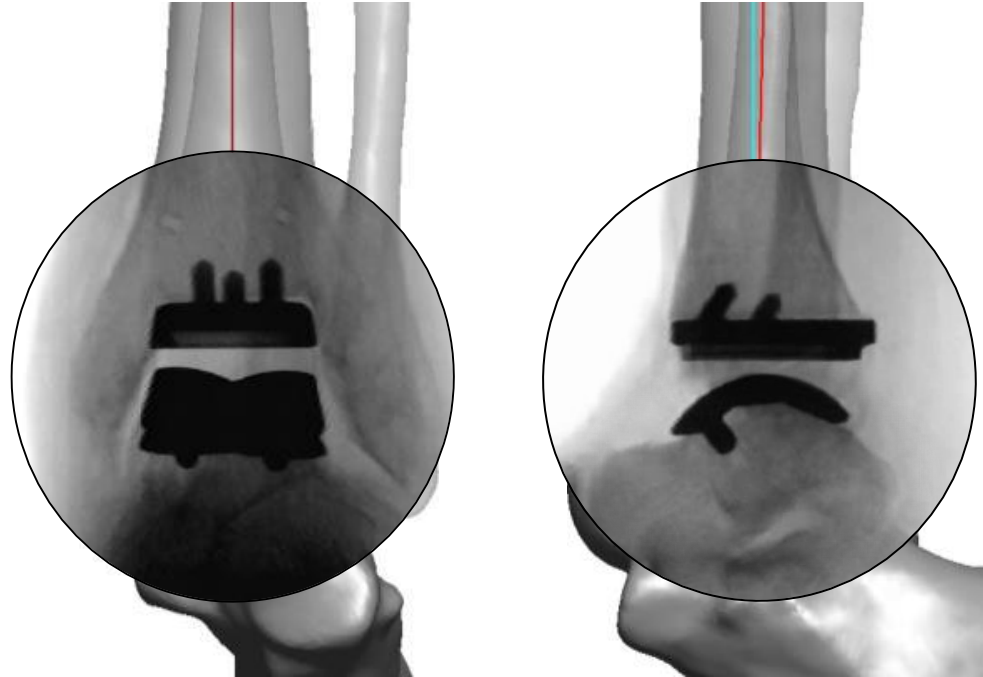
Orient PROPHECY® guide until the “surface match”

Verify coronal alignment matches pre-operative plan and pin



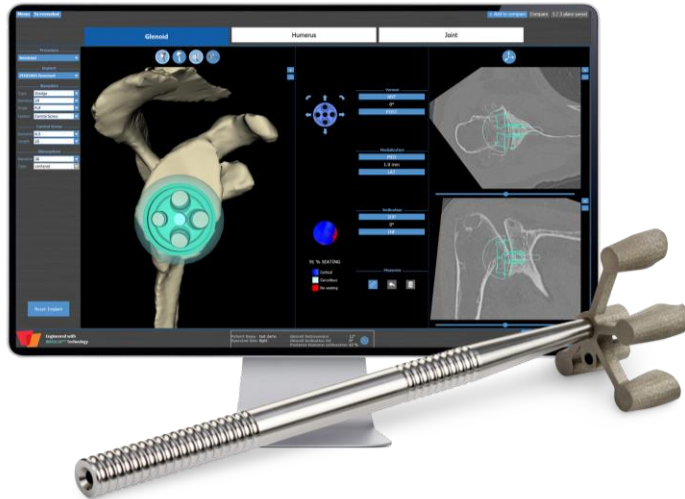
PROPHECY® INFINITY®

Pre-Operative Navigation System

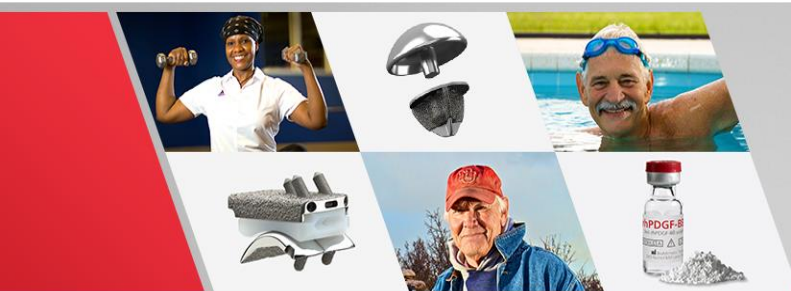


Envision the Results™

TSA



TORNIER
BLUEPRINT™
3D Planning + PSI



Cloud Based DICOM Delivery



Blue Print

Also is a pre-operative planning

with automated 3D reconstruction of the shoulder.

We can virtually place the implant, test the ROM and select the best surgical option

PSI Guides are proposed to accurately replicate the planned procedure

OMS will help to track the case and gives access to the planning documents

1. Software



2. PSI



3. OMS

Ajouter un nouveau Champion		Filtrer par				Noms des équipes		Rechercher	
ID	Nom d'athlète	Pays	Vitesse	Genre	Date d'expiration	Nb de planifications	Stat		
01K	FAB ADRIAN	FR	21.3	✓	2017-02-22	1000	✓		
01T	JEROME ADRIAN	DE	21.3	✓	2016-04-04	996	✓		
124	Bergman ADAMZEWISSE	FR	21.3	✓	2016-08-08	1000	✓		
05V	Bergman ADAMZEWISSE	FR	21.3	✓	2016-10-27	1000	✓		
267	SATHINA ADWIN	GB	21.3	✓	2016-06-27	1000	✓		
04L	Charles AGOUT	FR	21.3	✓	2017-01-30	999	✓		
06K	Philip ARRENS	GB	21.3	✓	2017-02-01	1000	✓		
03S	Toshitake AIZAWA	JP	15.0	✗	2016-03-23	1000	✓		
067	IMBIL AL ASSAF	FR	21.3	✓	2017-09-22	999	✓		
01X	JAMAL ALEXANDER	AU	21.3	✓	2016-04-07	999	✓		

Affiner 10 + autres

1 2 3 4 5 6 7 +

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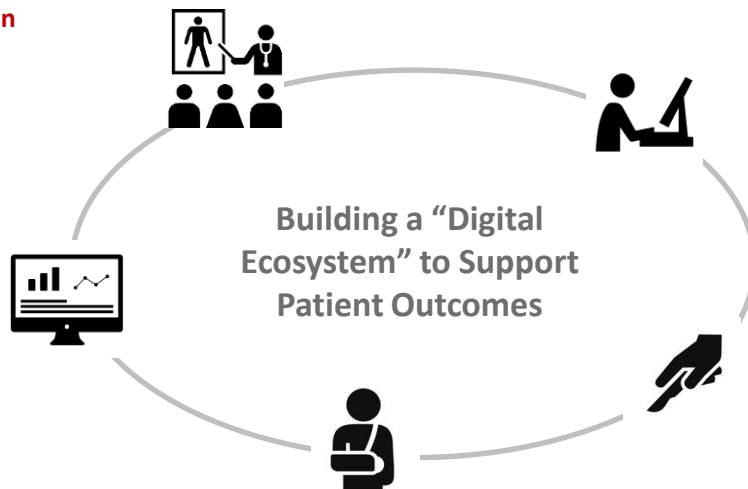
Virtual Reality & Digital Ecosystem

Medical Education

- **Peer-to-peer case consultation**
- Virtual training platforms
(powered by virtual reality)

Analytics

- **Patient outcomes & clinical research database**
- Comparative outcomes analysis



Post-Operative Monitoring

- Smart sensor-enabled patient monitoring
- Patient education and **post-operative care**

Virtual Surgical pre-planning

- 3D visualization and diagnosis
- Virtual pre-operative planning
- **Peer-to-peer case sharing**
- **Automated “plan my case” solutions**
- Implant / Inst. identification prior to case



Per-operative guidance

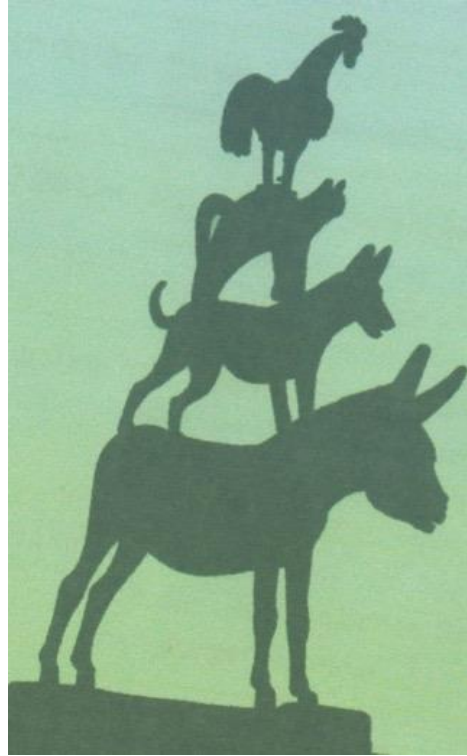
- Surgical guidance (powered by physical guides transitioning to **Virtual Reality**)
- **Patient-matched implants** (powered by 3D printing)

Virtual Reality

Dr. Gilles Walch and Dr. Jon J.P. Warner

3D Reconstruction & Measurements

In the video below (find on www.shoulderblueprint.com) you find more information about Blueprint and the 3D reconstruction of the DICOM images.



Vielen Dank für Ihre Aufmerksamkeit